STATE OF MINNESOTA DISTRICT COURT

COUNTY OF RAMSEY SECOND JUDICIAL DISTRICT

Case Type: Other Civil

- -

The State of Minnesota,
by Hubert H. Humphrey, III,
its Attorney General,
and
Blue Cross and Blue Shield
of Minnesota,

Plaintiffs,

vs. File No. C1-94-8565

Philip Morris Incorporated,
R.J. Reynolds Tobacco Company,
Brown & Williamson Tobacco Corporation,
B.A.T. Industries P.L.C., Lorillard
Tobacco Company, The American Tobacco
Company, Liggett Group, Inc., The Council
for Tobacco Research-U.S.A., Inc., and
The Tobacco Institute, Inc.,

Defendants.

- -

DEPOSITION OF CHRISTIAN D. WUNSCH, M.D., Ph.D.

Volume II, Pages 303 - 544

(The following is the continuation of the deposition of CHRISTIAN D. WUNSCH, M.D., Ph.D., taken pursuant to Notice of Taking Deposition, at the offices of Dorsey & Whitney, Pillsbury Center South, 220 South Sixth Street, Minneapolis, Minnesota, commencing at 8:27 a.m., September 4, 1997.

****

APPEARANCES

On Behalf of the Plaintiffs:
Howard R. Orenstein
Robins, Kaplan, Miller & Ciresi, L.L.P.
2800 LaSalle Plaza
800 LaSalle Avenue
Minneapolis, Minnesota 55402-2015

On Behalf of Defendant Lorillard Tobacco Company:
Mark Ginder
Dorsey & Whitney
Pillsbury Center South
220 South Sixth Street
Minneapolis, Minnesota 55402

Clyde W. Curtis
Shook, Hardy & Bacon, LLP
One Kansas City Place
1200 Main Street
Kansas City, Missouri 64105-2118

Susan H. Carchman
Attorney at Law
908 Buford Oaks Lane
Richmond, Virginia 23235

Elizabeth Hoene Martin
Doherty, Rumble & Butler
2800 Minnesota World Trade Center
30 East Seventh Street
St. Paul, Minnesota 55101-4999

I N D E X

E X H I B I T I N D E X

P R O C E E D I N G S

MR. ORENSTEIN: Back on the record.

***

ADVERSE EXAMINATION (Continued)

BY MR. ORENSTEIN:

Q. Good morning, Dr. Wunsch.

A. Good morning, Howard. I'm sorry, Mr. Orenstein.

You can address me as Chris, I wouldn't be offended. I would be pleased.

Q. I've been called much worse, but these tend to be formal proceedings.

A. I am sorry.

Q. You understand, Dr. Wunsch, that you're still under oath?

A. I understand.

Q. Since the time we recessed yesterday and this morning have you reviewed any documents?

A. Yes, I have.

Q. Which documents?

A. I reviewed the document that you gave me with

respect to Doll's summary of forty years of data in male British doctors.

I reviewed the expert report of Miller, Wyant and Zeger.

And I reviewed the expert report of Samet.

And that's it.

Q. No other documents?

A. No.

Q. Are you prepared now to testify to specific instances where in your opinion Dr. Zeger and his colleagues have departed in their expert report from the standards that you enunciate in your report?

A. Yes.

Q. Are you prepared to testify to specific instances where, in your opinion, Dr. Samet has departed in his expert report from the standards that you enunciate in your export report?

A. Yes.

MR. ORENSTEIN: We've been joined by somebody else.

MS. MARTIN: I'm Elizabeth Martin. Doherty, Rumble and Butler.

MR. ORENSTEIN: Good morning.

MS. MARTIN: Good morning.

BY MR. ORENSTEIN:

Q. Dr. Wunsch, when we stopped yesterday we were talking about the types of error that you identify on page three of your report. It's random error, systematic error, and compounding.

A. Uh-huh.

Q. Is it your opinion that the possibility of these three types of errors renders unreliable the conclusions of over forty years worth of studies showing the association between smoking and various diseases?

MR. CURTIS: Objection, form of the question, that's overly broad and certainly overly general.

THE WITNESS: The findings that have been produced over that period of time are highly variable, so it's very difficult for me to assess which particular of those findings you wish me to address.

BY MR. ORENSTEIN:

Q. Well, why don't you --

A. They're not consistent in and of themselves. Your question, I think, presupposes that they've all come to the same conclusion, the same consistent answer. And, in fact, that's not true. And so I would say that, yes, obviously those particular studies have demonstrated in and of themselves that

they contain many systematic biases. They contain many types of error.

Q. Okay. Would you please tell me which specific studies showing association between smoking and disease you believe are unreliable because of the types of errors that you identify on page three of your report?

A. Yesterday I addressed, as an example of the kind of error, the kind of systematic bias that can be built into a study is to select a particular population to generate statistics associated with one particular finding in that particular population and then say that applies to all of mankind. Okay. That's the kind of systematic bias that somebody has actually built into a study. At the point I said as an example of this I do not think that it's appropriate to say that the statistics that somebody discovers with respect to male doctors in Britain necessarily are generalizeable to the rest of the world and certainly to the population of Minnesota. That's a clear systematic bias.

And if the study were to be repeated, even with Minnesota doctors, I am absolutely positive one would find different numbers, statistically significantly different numbers.

Now, when one finds statistically significant different numbers, does that in and of itself mean that the findings are, quote, unreliable? Not necessarily. But it certainly points to the fact that we don't understand what all the factors are.

Q. Doctor, I'm asking which specific studies do you believe -- which specific studies which find an association between smoking and disease do you believe are unreliable because of the three types of bias that you identify on page three of your expert report? Please name the specific studies. If you cannot, please tell me that.

A. I just named one.

Q. Okay. Which other ones?

A. Every -- every other reference that's in that particular report by Doll, that did exactly the same thing. Okay?

Q. Which other studies besides those?

A. What other studies besides's Doll's studies? Practically every epidemiological study begins with the assumption of a particular cohort attempting to extrapolate beyond that. So -- and this is true of practically every study that is being referenced with respect to attribution of smoking injury. There are those biases which are built in to the study. And

attempts to generalize the study, attempts to account for all those variables, very often fails. And that's the -- that's the point that I'm making consistently throughout my testimony, is that the state is presenting an argument that is terribly incomplete and terribly imprecise and probably terribly inaccurate, as well. And from that they're attempting to calculate to several significant decimal places exactly the damages that they've decided to attribute to smoking. It's such a fallacious argument.

So I -- I use the same brush in this particular instance to paint all epidemiological surveys. So if you're asking me which particular ones, I'll name them all.

Q. Their conclusions regarding the statistical association are all unreliable?

A. No, not their conclusions regarding statistical -- the statistical associations within their cohort; in other words, the statistics themselves do not lie. The people who lie are the people who interpret the statistics. So that the interpretations is where the fault lies, not in the statistics.

Q. Okay.

Are you familiar with MRFIT studies?
A. Yes, I am.
Q. Can you tell me what MRFIT means?
A. Multiple regression --
Q. It's not something you memorized?
A. I can't remember the last -- I remember the MR, comes from multiple regression of factors -- factors of something or another.
Q. Okay. If I told you it was multiple risk factor intervention trials --
A. Risk factors. Fine. Yes.
Q. Are the conclusions of those studies unreliable?
A. The conclusions of the studies, the interpretations of the studies -- there are -- there is considerable bounds of uncertainty with respect to those particular conclusions.
Q. And you don't agree with the interpretation of the data to the extent that that interpretation would be that those studies control for risk factors other than smoking and concluded smoking as a strong independent effect?
MR. CURTIS: I'm going to object to the form of the question. That's both overly broad and also ambiguous.
THE WITNESS: I believe there is a lot that is

not controlled for in that particular study.

In addition to that, some of the factors that are controlled for, the data associated with -- with those particular factors isn't necessarily as accurate as it could be and there's considerable amount of uncertainty, which is in the statistics themselves. And that uncertainty tends to be completely overlooked. People tend to concentrate on the averages, rather than the uncertainties associated with the statistics. And to the extent that the conclusions have not allowed for the misinterpretations, they're inaccurate.

BY MR. ORENSTEIN:

Q. You wouldn't rely on them?

MR. CURTIS: Objection to the form of the question. Ambiguous and vague.

THE WITNESS: I wouldn't rely on them to do what?

BY MR. ORENSTEIN:

Q. You wouldn't rely on them to conclude that smoking is a strong, independent risk factor for heart disease after controlling for other factors?

A. I would rely on them to the extent that I think smoking is a risk factor. To -- to impute strength based on studies where there is -- there is so much

confounding variables and variables which are not even addressed in the study, adds a considerable amount of uncertainty to the word strong. To the extent that conceivably, possibly, it could be weak.

Q. Okay. You wouldn't conclude from the Mr. Fit data that studies have adequately controlled for the -- for other risk factors in measuring the association between smoking and heart disease?

MR. CURTIS: I'm going to object to the form of the question.

THE WITNESS: I'm going to ask you to restate it.

MR. ORENSTEIN: Would you please read it back?

(Record read.)

THE WITNESS: I'm sorry, I still don't understand the question.

BY MR. ORENSTEIN:

Q. What don't you understand?

A. I don't know what you're asking of me to respond to.

Q. Do you believe that the Mr. Fit data support the conclusion that smoking is an independent risk factor for heart disease after controlling for other factors?

A. I do not believe that is demonstrated.

Q. Okay. Thank you.

Let's -- I'd like to ask you, then, going back to the Zeger, Wyant, Miller expert report. This is Exhibit 3107. I'd like you to tell me how much time you spent reviewing this last night.

A. Approximately an hour.

Q. How about this morning?

A. I haven't looked at it this morning.

Q. Have you had your memory refreshed or do you have any better memory of when was the first time you saw this report?

A. I'm sorry. I -- I don't -- I do not recall when I first saw this report. I really...

Q. Would you tell me --

A. I don't.

Q. Would you tell me your best estimate, in addition to the hour you spent last night looking at it, how much time in total you spent looking at the Zeger, Wyant, Miller report?

A. Looking at the report? Probably four hours.

Q. Is there something in the word looking at that --

A. Yeah. I thought about it a lot.

Q. About how much time have you spent thinking about it?

A. I haven't -- that's really very, very hard for me to put any reasonable bounds on.
Q. Okay.
A. But probably at least as much.
Q. Without telling me the substance of the discussions, have you visited with counsel about the report?
MR. CURTIS: Objection to the form of the question. Ambiguous as to -- ambiguous.
THE WITNESS: I expressed my -- my opinions about -- about the report, the structure of the model that was adopted. I don't think there was discussion associated with that. It was just my views that were expressed.
BY MR. ORENSTEIN:
Q. Thank you. Why don't you tell me now the specific instances where in your opinion Dr. Zeger and his colleagues have departed in their expert report from the standards you enunciate in your expert report?
A. I am completely unaware of a -- of any studies in the biomedical literature that attempt to relate various forms of human behavior to certain kinds of outcomes where one assembles three completely independent sets of statistics and data and takes an

association from one particular set of data, to apply to another set of data, to apply to a third set of data, when none of the subjects in each of these three sets of data are the same. I'm completely unaware of any study that's ever been done like that. I think that that goes far, far beyond the ordinary bounds of what a reputable statistician would attempt to do, attempting to come to some determination of, quote, the truth as perceived by the statistician. I think that what's happened is there's just been -- oh, it's going to be very, very difficult for us to come to an answer and so we're going to do it this way. And I don't think that would be defendable among statisticians as a means of coming to an approximation to the truth.

Q. What specifically do you believe is indefensible?

A. Just exactly what I said. The fact that you would -- that you would end up taking three completely -- three completely separate sets of data, from three completely different groups of people, and say, okay, it's as if they were all from the same group. That there's no bias. There's no uncertainty that's being introduced associated with this. I can rely absolutely upon this set of data as being

completely correlative to this particular set of data, which in turn is completely correlative to this particular set of data. And, therefore, I can make attributions based on this set of data, with respect to this set of data, and from this set of data, with respect to this set of data. I don't think that that's very defensible. And with no attempt -- with no attempt to put bounds on the uncertainty that's been introduced by taking these completely separate sets of data.

Q. Is it the fact of the three sets of data that troubles you?

A. Yes.

Q. Would two sets of data be acceptable?

A. No. One set of data. The data is available to the State of Minnesota. If the State of Minnesota is willing to invest the bucks, they can go out and there and collect that set of data that applies exactly to the patients they're making the claims about.

Q. Which set of data is available to the state of Minnesota?

A. The data with respect to the Medicaid population. The data with respect to whatever the Blue Cross-Blue Shield population is that's being

served. The people that presumably generated these claims.

Q. Which data do you believe the state should have sought out if only the state would have been willing to spends the dollars?

A. They should have taken the data from their population. And when it wasn't already available in a database, they should have gone out and collected it and put it in a database.

Q. What should they have gone out and collected?

A. The -- my understanding, which -- I'm afraid I'm also going to have to criticize the report in that I think I understand what's being attempted by the statisticians. But it's enormously confusing and I'm wondering whether or not part of the confusion in here is because of the number of authors, or whether the people are being deliberately vague. I have that uneasiness about when I read this particular study.

Q. You don't feel you fully understand the report as you testify today?

A. I think I know what they did. I believe I understand what they did with their data to generate the claims that they've made here.

Q. But you're not sure?

A. I'm not certain.

Q. Okay. Go ahead. I think you were in the middle of an answer when I asked you another question.

You were talking about what kinds of data the state could have gone out and gotten if they'd been willing to invest the money, --

A. That's correct.

Q. -- in your opinion.

A. That's correct.

They could have gotten all the data that they felt was necessary to build their final model based exclusively upon the population for which they are bringing the claims.

Q. But what would you have done?

A. I would have done exactly that. There is not a question in my mind that if I wanted to prove something, and go about proving it with respect to this -- with this particular population, I would have used that population, generated the data from that particular population. Not a question in my mind.

Q. What other data would you have sought out?

A. The data that was deemed by -- by the -- by the individuals in this expert report to have been necessary.

First of all, it was a smoking history. Smoking history isn't even taken from the patients. Smoking

history is taken from other Minnesotans.
Q. So you would have taken a smoking history from every Medicaid --
A. Absolutely. If I'm attempting to say --
Q. I didn't finish my question.
A. I'm sorry.
Q. You would have taken a smoking history from every Medicaid claimant?
A. Every -- or a broad enough sample to where I felt as though I had good statistical precision, yes.
Q. How many people would have been required to satisfy you as to the statistical precision?
A. Given the number of buckets that the state of Minnesota is attempting to make claims on, it would have taken several thousand.
Q. Okay. Several thousand per year?
A. Given the extent to which the state of Minnesota wishes to attribute changes in costs over a period of time, yes.
Q. If the damage period for which the state is claiming damages was from 1978 to 1996 your view is that it would take several thousand samples where smoking history was asked per year in that period to have a valid -- to reach a probably statistical conclusion?

A. Probably on that order, yes. Okay. Obviously one is -- one can use the data itself, looking for the internal consistency to extrapolate over time. That doesn't mean that every year has to be sampled with exactly the same amount. And, in fact, the statisticians can tell you fairly closely what those numbers need to be for the attributions that they wish to make. And since they can tell you what those numbers need to be, I think it's unconscionable that they end up using other numbers as surrogate numbers to make their case.

Q. Is there anything else that you would have done?

A. Yes. I think I probably wouldn't have thrown away some of the data that they decided to throw away.

Q. Which data?

A. In certain cases they decided to exclude, for reasons which I can't understand, they decided to exclude alcohol consumption. There was another thing here -- let me see if I can find it. I remember that one in particular. The other thing is the data with respect to, quote, dietary habits. I certainly would have, for sure, based on the Mr. Fit study, which you're referring to, certainly would have collected much -- much better data than the data that was

utilized in this study related to diet.
Q. Again, by interviewing a statistically significant sample in each year of the Medicaid population?
A. Yes. I mean that's what -- this is what this is all about, according to my understanding, is this particular population, so why wouldn't we use data from that population?
Q. And one of your criticisms is that the -- the authors of Exhibit 3107 threw out information about alcohol?
A. Yes. They excluded the information from alcohol and some other factor. I can't exactly remember what it is right now. I'm sure I can find it here, if I go back through.
Q. What other criticisms do you have?
A. Several. Perhaps one of the strongest criticisms, and if you want to, we can get into it later, is the accuracy with respect to the diagnostic data. This is -- the diagnostic data, the diagnostic codes being generated on this is absolutely totally controlling for the economic damages that are being assessed. And that data is very, very inaccurate.
Q. Have you reviewed any of the ICD-9 codes from either Medicaid bills that this -- that the state of

Minnesota has paid?

A. No, I have not.

Q. Have you reviewed any of the ICD-9 codes for any of the Blue Cross population for which damages are being claimed?

A. I have not.

Q. What other criticisms do you have?

A. In addition to not only is the -- does the coding not reflect the clinical diagnoses, which I'm absolutely confident it does not, there's been enough studies done on that already to indicate the kind of inaccuracy and I believe that an adequate sample and an adequate review of the medical records in this particular case would be another thing that I would have done to the study just to put some bounds on the amount of inaccuracy, the amount of imprecision that occurs there.

But there's really another more important underlying factor. What that factor is is the -- is the error rate in the clinical diagnosis. And we know from other studies that in this kind of population and for the diseases for which Minnesota is attributing risk from smoking, that there is a significant bias in the diagnostic accuracy with respect to smokers and nonsmokers.

Q. What is that error rate for the Minnesota Medicaid population?
A. I have no idea.
Q. Excuse me.
From 1978 to 1996?
A. I have no idea. But it's significant. It's substantial. We're talking about lots and lots and lots of millions of dollars with respect to what the state is claiming.
Q. You're comfortable using the word substantial in this context?
A. I am.
Q. Not in the context of whether smoking is a substantial factor in bringing about disease?
A. When it's relative to my salary it's very, very substantial.
Q. And what is the error rate in the use of ICD-9 codes in the Minnesota Medicaid population from 197O to 1996?
A. I have no idea what the exact rate is. Again, it's substantial. It is very significant. Am I talking about 5%? No. Am I talking about 10%? No. Am I talking about possibly 50%? Yes.
Q. How about in the coding of the Blue Cross-Blue Shield population issue in this

lawsuit?

A. I would expect something similar. Very similar error rates.

Q. 50%?

A. Could be.

Q. Probably?

A. Possibly. I think that would be -- I would probably -- I would guesstimate 50% is my upper bound.

Q. What other criticisms do you have?

A. The last criticism that I have, which is -- which is again absolutely pivotal and fundamental to the way in which this particular model decides to attribute injury, and I'm going to make the point here with data that's cited from the report. On page two.

Q. Go ahead.

A. From the Independent State Behavioral Risk Factor Surveillance System Surveys, which doesn't have anything to do with the Medicaid population directly, the state has decided to use these particular figures. That for current smokers, persons obtaining health insurance through their employer or union, there are in -- over this period of time, 24.6% who are current smokers; persons

covered by Medicaid are 39.0.

Now, let's make a little argument here. It would appear that being covered by Medicaid greatly increases the chance of smoking. It would appear if in fact smoking causes disease, that being covered by Medicaid causes disease. And, if so, I guess it must be the state of Minnesota's responsibility to provide for that particular cost in any appropriate model for dividing damages.

Q. Would you elaborate on that, why you believe that?

A. I mean this is -- this is the sort of logic that we see throughout the expert -- the expert testimony that you have here.

Let's do it again. If I am not covered by Medicaid my chances of smoking are 24.6%, but if I'm covered by Medicaid I have all of a sudden increased my smoking to 39%; therefore, being covered by Medicaid must have caused another 15% -- or almost -- not quite double, but increased by sixty some odd percent the amount of smoking; right? And this is what it says right here. Therefore, that particular 60%, since it was the state of Minnesota that decided to cover with Medicaid, they should be responsible for that fraction of the disease, because they're the

ones who were the obvious cause; correct?

Q. Are you stating that is your opinion?

A. No. I'm just stating it as an example of interpretation of statistics. I'm stating this as an example of erroneous logic. I'm stating this as an instance by which people can take numbers and distort them for particular political views and purposes.

Q. And you use this as an illustration of how you believe the association as found in epidemiological studies between smoking and disease have been distorted for political purposes?

A. In some instances, correct.

Q. Thank you.

What other criticisms do you have of the Zeger, Wyant, Miller report?

A. Well, let's look at this number again, okay? What -- what is it -- what would a reasonable person say -- what's some likely explanations for this particular difference in population? Socioeconomic status. Okay. Is there a difference there? Well, in fact we know that's true. We know that's true for a lot of behavioral variables. We also know it's also true with respect to the appropriate diet that people consume. We also know that diet has a relatively profound effect on cancer rates. We also

know that the surgeon general, among other people, have said that a balanced diet and the failure to achieve a balance is the biggest of all the preventable risk factors. Okay?

Q. Do you believe the surgeon general is a reliable authority on the subject?

A. I'm just saying this is an example of the kind of pronouncements that one sees on these kinds of issues with respect to factors in the population. Okay.

I do think, however, that there are some reliable underlying studies, including some that are cited in Samet's report. And -- and what's happened is the state of Minnesota has chosen to systematically exclude all of these other important behavioral variables.

Now I'm not exactly certain which Solomon there is out there that can really attribute how much of socioeconomic status, how much of diet, how much of other health habits. How much of exercise. Et cetera, et cetera. All of which are very significant variables, to greater or lesser degrees, in every category of where the State of Minnesota has decided to attribute--we're going to blame everything that is in any way possible as a confounding variable

associated with smoke, we're going to blame all of that on smoking. Okay? And that is so anti-scientific that it just rankles when I see some scientist come and purport to be an expert and purport to make that sort of attribution. I mean it's so far from the truth. I mean the truth -- the truth is screaming at us that there are other important things here. Why do we choose to ignore them? It's being -- but that's what's happening in this model. Let's just ignore it. We can stick this off to the side.

Not completely ignored -- the model does allow for certain kinds of adjustments. There is some attempt to adjust for it and that's -- brings me up with the other -- the last point that I have with respect to this particular study, is that when one looks apparently at the uncertainty -- and the study is very, very vague about that; as a matter of fact, I'm absolutely positive that this is the sort of thing that would never get by a reasonable referee of a journal -- was at the end there is a little section on the report where -- where Zeger, Miller, and Wyant discuss some of the uncertainty with respect to the report. And -- and basically all they do, which I find extraordinarily strange, is they say, okay,

there is this variable that statisticians sometimes use called R squared, and R squared isn't very reliable. And, as a matter of fact, there's even -- they can even point to some particular study to where the courts need to be very careful about the application of this R-squared variable. But there's lots of other variables that are generated from this kind of data that provide some bounds associated with the uncertainty. And the fact that they say, gee, you know, you really shouldn't look -- they don't even cite what the R squared is associated with this particular study. Number one. Number two is I'm not sure which of the R squared because they're using several sets of data that they're referring to. Whether it's an R squared from their final model, or whether it's an R squared from some of data that goes into their model. That certainly isn't clear.

But in any case they say -- they don't provide the number here. They just say, oh, by the way, don't attempt to use that particular parameter as a means of making your judgment with respect to whether or not you can reach any kind of conclusion.

Well, there's two different -- two different things that we do with uncertainty in statistical data. One is you can sometimes come to a conclusion

from statistical data that -- that you can say, okay, from the data the probability of something is -- is, you know, ten to the minus umpteen. Okay? So we're very, very convinced that this is an element of the data, no question but what this is element of the data.

But when we say how certain are we, to the extent which that's a controlling variable? Okay. We can't throw away statistics about statistics in that case. You have to -- you have to provide them. And maybe they do. They refer to a disc in here, where they've provided additional data. But I can't see a printout of that particular disc, so I have no idea what this is.

Q. Dr. Wunsch, which variables do you believe this Zeger report adequately controls for?

A. I don't think it adequately controls for any of them.

Q. Which variables do you believe are inadequately controlled for?

A. All of them.

Q. Well, what -- all of what?

A. I think that the only -- the only variable --

Q. Just list them.

A. As far as I know -- I think that probably the

number -- total number of dollars that were paid out on Medicaid patients, I think that's probably an accurate number of dollars.

Q. An accurate number?

A. Is an accurate number of dollars.

I don't doubt the accounting that the state may have with respect to the total number of dollars provided for Medicaid.

I think that it's very inaccurate with respect to the amounts of those particular dollars that can be attributable to this diagnosis or that diagnosis. I think there's tremendous inaccuracy associated with that.

Q. My question was which variables, risk factors, demographic status, do you believe the report does not adequately control for?

A. Oh, I don't think it -- I think probably age and sex are more or less -- I think there's a lot of uncertainty with respect to the way they deal with that, because they use multiple sets of data, each one of which introduces additional uncertainty. I think they could have minimized that. I think that it's unconscionable that they didn't minimize that.

I think that when one is talking about bringing a suit where you're interested in recovering billions

of dollars' worth of damage, that it's worthwhile to take maybe 1% of that. I think it might have been worthwhile over the entire period of time, if in fact the State of Minnesota is really concerned so much about the welfare of its citizens, that they could have actually taken some preventive stances with this sort of thing beforehand, during that period of time.

Q. Okay. Other than age and sex which variables do you believe are not adequately controlled for in this report?

A. Okay. I named several. First of all, diagnosis. No question about it. No question about it. Tremendous inaccuracy associated with that. And it's absolutely pivotal with respect -- and there's two parts of it which are inaccurate.

First of all, the coding process, which the statistics are absolutely dependent upon, introduces a significant amount of inaccuracy. And behind that there's a clinical inaccuracy. And that's a little bit more difficult to get to, by the way, but at least one could cite, one could refer to a number of other papers that are in the literature.

It's interesting how when we get to making arguments about conclusions, about statistics, how we choose to -- how we choose to ignore the statistics

that are not consistent with our particular view. Would these statisticians look at these reports that prevented -- or presented as references in my expert report and say those are invalid studies? I don't think they would.

Q. Okay.

A. I think they would look at those and say, yeah, this is a problem. This is a confounder. This is the sort of difficulty that we need to deal with. Did you deal with it? No, we didn't deal with it.

Q. Other than age and sex and bias and diagnosis and inaccuracy in ICD-9 coding, what other variables do you believe this report does not adequately control for?

A. Okay.

Q. I'd just like you to list them.

A. Okay. I'm going to list them and I'm going to tell you, also, that those are the ones that pop to mind first off.

I mentioned earlier that I think socioeconomic status. Now, in and of itself that is a measurable parameter to some extent. Not the socio part, but the economic part is something that we can -- we can assign some degree of certainty to. That also is correlated with a lot of other things. And among

those other -- those other behavioral variables are diet, exercise habits, alcohol. Those are rather obvious important variables, some of which were obviously important variables in the MRFIT studies and other studies that have demonstrated those.

I wouldn't exclude other factors. The nature of statistics is that -- that we attempt to add more and more --

Q. What other --

A. -- understanding.

Q. What other factors, Doctor?

A. What other factors would I -- practically anything that has to do with -- with people's living habits, family relationships, occupation, et cetera.

Q. What other factors?

A. That's -- that's most of them.

Do I think there's other factors? Yeah. If we wanted to wait around here long enough I could probably find more.

Q. Okay.

A. Previous disease. Access to health care. Access to health care. I'm sorry. I forgot a major, major, major one. Access to health care. Extremely critical with respect to medical outcomes.

Q. What other criticisms do you have that you

haven't yet expressed?

A. With this -- with respect to this report?

Q. Yes.

A. None.

Q. Am I correct that if the authors of the report were to file a supplemental report that expressed confidence intervals that tried to assign boundaries to their conclusions in statistically-acceptable ways that you would not criticize the report?

A. I -- unless they address it -- my fundamental criticism, the fact of, okay, we're going to use three completely separate sets of data to reach our conclusions, we're going to put these things together in that way, and now I'm going to add whatever I think my uncertainty is over here, with respect to my uncertainty over here. Unless I know how those uncertainties work with each other, whether or not they behave as independent variates, or whether or not, in fact, they may end up being adding variates, and I don't know that, and I don't think that they can state that. There is no way that I can think of that they would address my -- just by looking at whatever they have for data, that they would address the problem with respect to diagnostic accuracy.

If they wanted to take other studies that have

been related to diagnostic accuracy and say, okay, let's take as a lower bound in this particular study they found that there was 40% inaccuracy rate with respect to the diagnosis of lung cancer, so that we're going to subtract out 40%, we're going to use that as a bounds. If they were to do that, yeah, I'd be willing to accept those sorts of things.

I couldn't say blanket in advance without reading how they were going to adjust their statistics, whether or not I would accept it because I don't think that they would do it the way I suggested.

Q. Okay. Let's go to the Samet report, which is Exhibit 3108; do you have that?

A. Yes, I do.

Q. Would you please identify the specific instances where, in your opinion, Dr. Samet in his report has departed from the standards that you enunciate in your report?

A. I'm going to pick just a couple of areas, just as what I regard as rather flagrant -- well, that's too strong. Let's say what I believe is a political pronouncement rather than a scientific pronouncement of Samet. That I don't think that most of the rest of the scientific community would agree with. And

the flavor of that permeates practically everything else that the gentleman says.

When he discusses -- I'm not going to -- I'm going to get to a couple things. When he discusses peptic ulcer disease on page twenty-two, just as an example. And he says peptic ulcer disease can be a substantial source of morbidity. Very often is not a source of mortality. But obviously it can be a matter of great cost. For uncertain reasons, morbidity and mortality from peptic ulcer disease has declined sharply in the last decades.

This is rather unusual for him to state that for uncertain reasons. He seems to be very certain about everything else. But he's perfectly willing, in spite of that uncertainty, in spite of the fact that he starts off by saying we don't really understand what's going on here, but -- but we know whatever is going on here is mainly due to smoke.

Now has smoking declined significantly? Does that account for the drop in the morbidity and mortality? And his words are declined sharply. Okay. We're not talking about a little change here. We're talking about a major change. All right.

And yet -- and obviously that particular fraction that changed he's not willing to attribute

to smoking. He's saying we don't understand what it is.

On the other hand, he's perfectly willing to attribute a major part of the damages associated with peptic ulcer disease to smoking and he says so -- he says so right here. He says, "Smoking increases gastric acid secretion and tends to increase duodenogastric reflux (reflux of bile from the duodenum into the stomach). Okay.

Now, one of the things that Dr. Samet has chosen to ignore is an absolutely huge and overwhelming amount of gastroenterological data that has not found a significant association with gastric secretion and the cause of peptic ulcer. So -- but nonetheless he says smoking can do this. The fact is that whenever this seems to happen, there doesn't seem to be any causation with respect to peptic ulcer and the reason is relatively simple.

And then he finally gets to it. He says Heliobacter pylori, a bacterium, is now recognized to be a cause -- a cause of peptic ulcer disease. Okay? The 1990 report notes that smoking is associated with peptic ulcer disease in persons with gastritis caused by this organism.

In other words, the smoking attributable to

peptic ulcer disease absolutely seems to require this particular organism to -- for peptic ulcer to develop.

Now I'm not exactly sure how smoking causes people to get their stomach lining infected with this organism. Never have understood that argument. Okay? But, nonetheless, we're -- we are perfectly willing to say that a huge chunk of whatever these damages are, obviously is due -- and in part we're saying that because the surgeon general concluded that smokers who stop smoking may improve the clinical course of peptic ulcer disease in comparison with those who continue to smoke following the diagnosis.

And interestingly enough that particular surgeon general's report was made in advance of a lot of the data that was collected subsequently to the understanding of the role of Helicobacter pylori. And, in fact, the way you treat that disease you may ask -- it probably wouldn't be imprudent to ask some people to stop smoking because it ends up being a relatively simple thing that you can ask a patient to do. But it would be unconscionable not to treat the bacteria. That's the way you treat the disease and that's the way you cure the disease. That's the way

you, at least, eliminate that particular instance of it.

And when I see this written like this I mean -- okay. Two possibilities come to mind. One possibility is maybe the gentlemen is really very naive about these particular facts. And which is quite possible.

Some of the medical epidemiologists that I know, they get off into their epidemiological -- epidemiological niches and medicine sort of leaves them behind. Others stay very conversant with the standards and the practice of medicine.

I don't know where to put Dr. Samet in this particular case. But I find it difficult that this is -- that this is something -- this should have come from a pulpit, rather than a scientist. It's just not, you know... He wouldn't -- you would not find very many gastroenterologists that would come to this same conclusion.

Q. What other criticisms do you have?

A. I use this as an illustration. I can cite other instances. Certainly the area of cardiovascular disease, where, again, he's -- he's borrowed from a lot of associations where, oh, we find that because of smoking that there's twice as much of this

particular thing that's over here, obviously due to smoking; correct? And, in fact, in a certain number of those particular instances, we know that confounding variables play -- when we say confounding variables, other variables. I even hate to use the word confounding variables on studies because I'm getting dragged into using the language that's being used by the people who are advocating a position.

Other variables explain the significant differences in the statistics between smokers and nonsmokers. Not just the smoking itself, but the fact that smokers are different people from nonsmokers, okay? It's just not like what we've taken this pristine example of a human and we've put a cage over here, where we make pizza over here, smoke in these dump smoke, but otherwise they're identical; you know, we've taken identical twins, and we've done whatever we've done to attempt to control for all these other behavioral variables. No, we just choose to ignore them and we say, oh, must be due to smoking.

And there are very significant roles of other confounding variables, particularly in the areas of cardiovascular disease. Particularly in the area of certain other -- in the areas of pulmonary disease,

in general, the COPD, asthma, et cetera.

Q. Do you believe that Dr. Samet has failed to acknowledge the influence of other risk factors?

A. Yes.

I think that Dr. Samet has adopted a -- a position that I think he probably feels that he's -- that he has a clear conscience about, that he's perfectly willing to preach.

I think to the extent that he attempts to represent himself as a scientist, and provide a balanced view of the scientific data, he can be seriously faulted, and I fault him.

Q. Okay. Yesterday you indicated that you were here as part of your professional practice of medicine.

A. Yes.

Q. Do you remember testifying to that?

A. Correct.

Q. Is it your view that Dr. Samet is more in the role of a preacher than a doctor?

A. In these instances he comes closer to being a preacher than he does a doctor.

Q. Okay. What other criticisms do you have?

A. I don't have any other criticisms.

Q. Do you agree --

A. I mean his -- in the sense that -- what I've said, that he selectively ignores a lot of the data, including data he even summarizes in here. And the fact that he supports this model, according to this study, that they did this in consultation with him. Gosh, you know, I have some real problems with that.

Q. Do you agree with his conclusions on causation?

A. I do not --

MR. CURTIS: Objection to the form of the question. Overly general.

THE WITNESS: When he says that peptic ulcer is caused by smoking, absolutely, categorically, unequivocally, I object to that, yes. No question. No question.

BY MR. ORENSTEIN:

Q. What about lung cancer?

A. With respect to lung cancer, I've stated my position on that earlier. I think that the links that I would regard as a scientist, the causative associations have yet to be established in that particular area. I have said with that respect that I am very open to the possibility. I have said that I do recognize that -- the statistical data that's been assembled from many, many studies indicating in one study this amount of risk, another study another

amount of risk, that there's a certain consistency with respect to the fact that there appears to be some risk. I do admit, to some extent, that there are certain underlying chemical potential explanations. But I think there's tremendous amount of uncertainty yet with respect to what I would regard as cause.

Q. Do you agree with Dr. Samet's conclusion on causation of lung cancer?

A. I do not agree with it.

Q. Okay. Without going through all the other diseases he goes through, is it fair to say you don't agree with his conclusions on -- that smoking is a cause of the other diseases he lists in his report?

A. I don't think that it's a scientifically-established cause, no.

Q. You disagree with Dr. Samet on those diseases, too?

A. Yes.

Q. Any other criticisms?

A. No.

Q. As long as we have the Samet report --

MR. ORENSTEIN: Well, why don't we take a short break. I'd like to mark some exhibits.

MR. CURTIS: Of course.

MR. ORENSTEIN: Thank you.

(Exhibits 3115 - 3121 marked for identification.)

MR. ORENSTEIN: Let's go back on the record.

BY MR. ORENSTEIN:

Q. Dr. Wunsch, would you turn your attention, please, back to your report?

A. Sure.

Q. I'd like to direct your attention to the bottom of page two, of Exhibit 3103.

A. Okay.

Q. The paragraph on the bottom of page two under "Causes of Disease" says, "The concept of 'cause' has different meanings in different contexts, and no definition of cause is equally appropriate or correct in all sciences or situations. For example, public health officials may make a causal inference based on epidemiological data, while treating physicians or experimental scientists may require more data or evidence before coming to a conclusion of causality."

Is that your opinion?

A. Yes, it is.

Q. You believe that the public health officials who make causal inferences based on epidemiological data are wrong?

A. In some cases, yes.
Q. In the case of smoking and disease?
MR. CURTIS: I'm going to object to the form of the question. That's overly broad and vague.
THE WITNESS: I need to narrow that down.
Are there any instances in which -- in which I would accept that in fact smoking has direct, although maybe understood negative effects on people? I mentioned those yesterday.
I think that people who in and of themselves know that when they smoke that they -- they precipitate asthma attacks, and when they don't smoke they don't get the asthma attacks, those people end up being their own control. And I think for those particular individuals, yeah, there is some way, as not -- well understood, the experimental scientist would say, well, does it always happen or does it mostly happen? And you say, well, it happens with enough regularity that any reasonable person will adjust their behavior and say don't smoke. It's precipitating attacks.
BY MR. ORENSTEIN:
Q. Those are the instances, asthma, bronchiectasis?
A. Not bronchiectasis.
Q. I'm sorry. I thought --

A. Not bronchiectasis.
Q. I thought you said yesterday that that was one of the instances where smoking significantly exacerbates the illness.
A. Exacerbates. Not cause the illness. That's another instance -- number one, I didn't say cause the illness. I said it causes ill health effects. Okay. I'm making a distinction there, that I would admit to a role.

I think the epidemiologist would say it causes. Okay. I think the treating physician in a particular case, like that, that discovers this sort of relationship with respect to an individual patient, would say I don't understand what the exact mechanism is here. I'm not -- I don't know to where I can say that I appreciate at the molecular level what causation is occurring here, but we know that when you do this, you get an attack, okay? And, therefore, you shouldn't smoke. Okay?
Q. And --
A. And I would accept that as one definition of causation.

And I would think the epidemiologist in that particular case would say it causes asthma attacks in susceptible individuals.

Q. Other than the examples that you've given, do you -- well, strike that.

Is it your understanding that public health -- is it your understanding that public health officials have made causal inferences in which they've concluded that smoking causes lung cancer?

A. Have they done so? Are you asking whether I know whether they've done so? Yes, I do know some of them have done so, and Samet has done so in his report, as an example.

Q. And heart disease?

A. Yes, I'm aware that there are epidemiologists who have made those claims, as well.

Q. Public health officials?

A. Public health officials? I'm assuming that, in fact, some of them have. I mean if you regard the surgeon general as an example of a public health official, that would be an example of someone who has.

Q. Do you regard the surgeon general as a public health official?

A. I think he overseas that particular branch, or to a significant extent influences that particular part of the government bureaucracy.

Q. Doctor, I'd like you to answer my question.

Do you regard the surgeon general as a public health official?

A. No, I don't. I said earlier that he's a political appointee.

Q. Okay. Is it fair to say that --

A. He has a public health title.

Q. Is it fair to say that physicians such as yourself practice medicine and that the surgeon general practices politics?

A. As a generalization, yes.

Q. That's your opinion?

A. Yes.

Q. Okay. And specifically in the context of smoking and disease you believe that?

A. Yes.

Q. Okay. Is it your view that the public officials who have made causal inferences about smoking and disease are on an equally-valid footing as the physicians or experimental scientists who have not?

MR. CURTIS: Objection to the form of the question. Ambiguous and confusing.

THE WITNESS: I don't understand the equal-footing business.

BY MR. ORENSTEIN:

Q. Okay.

You're saying in this paragraph that we've been discussing --

A. Yes. Right.

Q. -- that people look at this from different perspectives.

A. Correct.

Q. Are those perspectives equally valid to you?

A. For -- for different -- maybe -- they're not equally valid in a general broad sense, no. With respect to specific inferences that they may be making, within the context that they're dealing with at the time, they each have their own validity, yes.

Q. Do you the surgeon general's inferences on smoking as a cause of disease have the same validity that you attribute to your own views?

MR. CURTIS: Objection to the form of the question. Ambiguous.

THE WITNESS: This was with respect to smoking and --

BY MR. ORENSTEIN:

Q. As a cause of disease.

A. As a cause of disease?

Q. (Nodding.)

A. We're very, very different in that respect. And with respect to the viewpoint, with respect to the

idea of causation, I think that there's a fairly radical difference there.

Q. So you don't attribute to them equal credibility, his views and yours?

A. Credibility. Do I think that the surgeon general is being deceitful? Do I think that the surgeon general is -- is wildly mislead because he's ignorant or whatever else it is? No, I don't believe any of that.

I do believe that the -- that I'm not aware of a single surgeon general that I would put on the same pedestal as -- as perhaps a hundred experimental scientists that I could name. And -- and I -- and I would regard the views of any of those hundred experimental scientists much more credible than I would the surgeon general's.

Q. Okay. Again you've set up two constructs here. One is the construct of public health officials making causal inferences about smoking --

A. Yeah.

Q. -- and disease.

And then you've set up physicians or experimental scientists who in your view take a different approach and reach different conclusions; is that accurate?

A. That's correct.

Q. Are the public health officials who make causal conclusions about smoking and health correct from a public health perspective?

A. They may be. I think what happens is if I -- if I have a responsibility of making recommendations with respect to people's behavioral habits, that I look at two other really important statistics that the experimental scientist doesn't even care about, but the public health official does have to care about.

The experimental scientist would, to an extent, when we -- when we're working on diseases in insects, we don't have a tremendous rapport -- we don't have a tremendous feeling, we don't have a lot of sympathy for how those things work. All right?

The experimental scientist that looks at human disease with that same sort of view, okay? Completely detached from whatever the consequences of whatever their particular behavior are, that person is looking at the pure relationships of the variables themselves. The controlling chemical, biological, biochemical, and behavioral, sociological and so on influences that are being manifested.

Now, the public health official has another

problem to deal with. The public health official has to say there are costs out there according to whether or not I espouse this view or I espouse that view. I may be wrong, but if my view is wrong, do I minimize costs by adopting a particular position?

One of the things that you'll find in a whole bunch of physicians is -- is whenever you ask any physician about, well, doctor, you know, does it -- does alcohol hurt in this particular case? Can I drink? And the doctor, in almost every case is going to say, well, do you need to? No, I don't need to. Well, then don't. All right. Why? Because you can advise someone to make a modification of their behavior, for which there may not be a valid scientific basis, but the question is what is the cost? The cost can be relatively small.

On the other hand, what can be the potential cost -- what can be the cost if in fact the behavior isn't modified?

The epidemiologist looking at the statistics says, gee, you know, it appears as though that there is -- there's this -- there's this, without question, this major statistical association that we have over here. Now, I don't know -- if I'm an honest public health official, I don't know if I tell these people

out here to modify this particular behavior that it's going to make everything well again. But my position is, gee, if I can tell them that they shouldn't smoke, I'm going to tell them they shouldn't smoke because I'm looking at what is the optimal decision in terms of if we want to use the -- what the mathematicians would use in this particular case, game theory. Where do I get the zero sum? Okay. I move it way over here, where I may be wildly long in a very large fraction of cases, but so what? Okay? I'm minimizing -- I'm looking at the problem of minimizing -- from my view, the potential of minimizing a lot of potential damage. And if in fact I achieve that, I really don't give a damn whether I'm right or wrong. If it works out, for whatever reason, whether it's because of causation or because of some unrelated associated behavior that goes along with cigarette smoking, that I've changed the picture by advocating a viewpoint, I'm going to advocate that viewpoint. And I think that's what public health officials do in many, many cases.

Q. Isn't that only what is responsible for them to do under the circumstances?

A. That's the -- I think it's their job to say -- to say -- there's two things. I'm looking at data,

I'm looking at -- I'm looking at a lot of risk factors that are out there. And my responsible position is, because I don't think anybody has to smoke to get a full measure out of their life or whatever else it is. And I think a lot of people maybe are going to be -- have -- potentially end up with various illnesses, so I'm going to advocate that, hey, the safe way out, the minimum cost way out, from a public health perspective, is to say you shouldn't do it. And so I'm going to advocate that viewpoint.

And do I fault them for doing that? Not at all. What I fault them for is when they say I know that this causes this. There is an intimate causation that is going to satisfy this experimental scientist that I'm talking about out there, who doesn't give a damn about what the costs are, who only cares about, quote, the truth. Okay? I'm one of those people who tends to be a lot more critical with respect to the idea of what the truth is.

My policy -- my profession -- what pathologists are, is they're critics of other doctors, okay? When we do an autopsy, hey, we do it with respect to pointing out the flaws in the programs and the treatment of medicine and we really don't care who

gets hurt in that process.

I have never known a pathologist who bastardized or falsified an autopsy or any other data that they have that provides an objective measure of disease. That's their job.

They are very often other doctors' doctors. They are critics of the way other doctors practice. Fortunately they don't have to worry about all the other things doctors have to worry about. They're primarily concerned about the truth. Okay?

The other doctor has to worry about, gee, you know, the soul that I'm dealing with here, if I give him this therapy, maybe they're going to lose their job. They've got four kids. Whatever else it is. Maybe I should be treating them with a higher dose.

But, you know, I don't have to worry about that. I'm spared that as a pathologist. And so when I look at disease and causation associated with disease, I look at it for two reasons. First of all, I started off as a -- more as a pure scientist. I'm a biochemist. I've spent more time being a biochemist than I spent being a pathologist in a number of ways. So I look at these things -- pure causation. And obviously I come up with a complete different perspective.

Q. I think I have a good understanding of how you view your role, --

A. Uh-huh.

Q. -- as opposed to how you view the role of those in public health who, in a broader sense, put the people's health as their primary responsibility above other considerations.

A. Uh-huh.

Q. And it's only responsible for people in the public health realm who accept the people's health as their primary responsibility, to come to the conclusions they've come to, isn't it?

A. I don't fault -- I don't fault -- I don't fault the conclusions with respect to the way they approach the population. No, I don't fault them for that.

Q. In your opinion, --

A. I think that they're attempting to do their -- their job --

Q. Okay.

A. -- the way that any other honest, hard-working professional would attempt to do their job.

Q. From the public health perspective?

A. From the public health perspective, yes.

Q. In your opinion wouldn't it be a reasonable thing to do, for somebody whose primary consideration

was the public health, to deny or minimize the effect of smoking on people's health?

A. Again, going back to what I said before: Is I think that the public health -- the charts that they have with respect to advocating behavioral modifications, et cetera, is that they need to be more concerned about the net result than the truth.

Q. Okay. So --

A. And they need to advocate the position that's going to give you the best net result, not necessarily a position that's going to be the truth.

Q. Over the population of people?

A. Correct.

Q. Okay. So, again, do I understand your opinion to be that it wouldn't be reasonable for someone from this public health perspective, putting the health of the general population first, ahead of other considerations, to deny that smoking plays a substantial role in disease?

A. I'm sorry. One more time on that.

Q. It wouldn't be responsible for somebody from the public health perspective, placing the people's health as primary, to deny that smoking causes health -- causes health problems in the population of people?

A. Let me see what I believe would be -- is the responsible thing that they have.

Q. I'd like you to answer my question. It wouldn't be reasonable?

A. Okay. I'm pretty much -- I largely agree with your thought.

Q. Okay. And it wouldn't be reasonable to minimize the risks, would it?

A. When one is attempting to minimize the net, it would not be prudent to minimize the risk, yes. I mean to -- to -- to -- I think that there's two parts to that. Let me qualify that slightly.

I think to the extent that anyone falsifies an interpretation of the data; to the extent that somebody selectively ignores data; to the extent that a public health official would do that, it would be inappropriate.

I think it would be completely inappropriate for -- for a public health official to say, let's see, we have ten studies, this one over here shows real high risk, and the other nine don't show such a risk, but I'm going to tell the people out there that this tenth study is what the real risk is because I want to modify their behavior. I think that can be counterproductive. I think not everybody out there

is that gullible. I think when the data is presented, and they say, look, this is my statistic, this is the way I look at this stuff, I'm not exactly sure, there's a tremendous amount of uncertainty here. But this is the data, I'm not hiding anything. I see this as a particular risk factor; I, therefore, advocate that you adopt this particular behavior modification, okay? That's responsible.

Q. Continuing on with your example. If there were ten studies that showed that smoking caused disease in the population, and one that showed that it didn't cause disease in the population, would it be reasonable for someone speaking from the perspective of putting the people's health first, --

A. Okay.

Q. -- above other considerations --

Excuse me, I'm still asking my question.

Would it be reasonable to call attention to the one study and not the ten?

THE WITNESS: Yes. Absolutely, unequivocally, categorically, yes.

Your statement was the following, and I'm going to quote you on this. Okay? You said if I see nine studies that say that it causes disease, and I see one study that says it doesn't cause disease, would

it be inappropriate to cite that study? We're using the word causation in the way I use the word causation. And if there is one study that proves that it doesn't cause it, than the other nine studies are wrong. It's that simple. And, therefore, it would be a lie and it would be irresponsible to make that -- to make that statement.

BY MR. ORENSTEIN:

Q. Okay. All right. Let's -- let's go back to the Samet report. And I'd like you to turn to page thirty-four of the report. Could you just quickly review pages thirty-four, thirty-five, thirty-six, thirty-seven, and thirty-eight, thirty-nine, forty, forty-one.

A. I'm having some problems finding those pages.

MR. CURTIS: May I?

MR. ORENSTEIN: Sure.

THE WITNESS: Maybe I'm in the wrong section.

MR. CURTIS: You're in the wrong section.

THE WITNESS: I'm in the wrong section. I got too far into the report.

MR. CURTIS: Starting at thirty-four?

MR. ORENSTEIN: Thirty-four.

MR. CURTIS: To forty-one?

MR. ORENSTEIN: Right.

THE WITNESS: Starts with Table 2?

MR. ORENSTEIN: Right.

THE WITNESS: Okay.

BY MR. ORENSTEIN:

Q. You've had a chance to look at that before, haven't you?

A. I have seen this.

Q. Do you recognize those statements as statements from the Surgeon General's Reports and the International Agency for Research on Cancer concerning smoking as a cause of the listed diseases?

A. I recognize that I've read this before. Some of this I think I probably am aware of from the actual sources. Others I'm not aware of from actual sources.

Q. Do you have any reason to doubt that those are accurate representations of the diseases and the statements from those studies about those diseases? I'm not asking you if you agree with them. I'm just asking if you have any reason to doubt that they are accurately set forth here?

A. That they've been extracted appropriately? I think they've been extracted probably appropriately. Generally I would say they're probably accurate.

A number of cases are actually quoted and I'm

assuming that those quotes are meaningful.
Q. You're aware that the surgeon general has found that smoking causes the diseases listed in Dr. Samet's report, with the exception of a couple that are found by the International Agency for Research on Cancer?
A. Yes, I'm aware that there's -- yes.
Q. Let's mark -- it's been marked.
Dr. Wunsch, I'm handing you what's been marked as Deposition Exhibit 3115.
A. All right.
Q. This is a document produced in this litigation. The title is "Smoking and Lung Cancer"; it bears the Bates numbers 105453524 through 105453535.
Am I correct that you've never seen this document before?
A. You are correct.
Q. This is an internal industry document and I just want you to read the first sentence of the first page.
A. The first sentence of the first page reads, "The evidence implicating smoking as being causally related to cancer of the lung is very strong."
Q. And would you please read the last paragraph on that page?

A. The last paragraph reads, "To avoid any misunderstanding, a little elaboration of the cause and effect theory is needed: The theory is not that smoking is the cause or the only cause of lung cancer, it is that although other factors may be involved, in the absence of the smoking habit, in particular the cigarette smoking habit, the lung cancer death rate in the community would be a small fraction of its present level."

Q. Okay. I'd like you to go with me to the fourth page of this document.

A. Okay.

Q. The pages aren't numbered, but if you're with me, the fourth page begins, "The first two forms..."

A. "The first two forms..." and it's got a number on the side, the 527 number.

Q. Right.

A. The last three digits.

Q. Yes. Thank you.

If you'll go down to the third sentence of that paragraph that starts, "Nevertheless..." Just --

MR. ORENSTEIN: Counsel, are you with me?

THE WITNESS: I'm sorry. The paragraph starts with what?

BY MR. ORENSTEIN:

Q. The sentence starts, "Nevertheless..."
A. The sentence starts, "Nevertheless..." Okay. About the sixth line down, or eighth line down.
MR. ORENSTEIN: Are you with me, counsel?
THE WITNESS: Yes, I am.
MR. CURTIS: Got it.
MR. ORENSTEIN: Your counsel wasn't as fast as you.
BY MR. ORENSTEIN:
Q. Just if you'd read with me. It says, "Nevertheless, to explain the increase in lung cancer during the last half century, and the relationship of countries' rates with their cigarette consumption, the 'type' hypothesis has to propose that some other factor has arisen during this time in every country in which the incidence of lung cancer has increased, and that this has happened in just the manner necessary to produce these spurious associations with overall cigarette consumption. No factor has been suggested which adequately fills this bill."
Are you with me on that?
A. Yes.
Q. And going down further on that page, right under the line that says "Experimental studies."

A. Yes.
Q. I'll read the first two sentences. "That smoking causes lung cancer in man cannot be proved by animal experiments. However, the fact that it has not proved difficult to show that condensed tobacco smoke produces cancer in animals provides support for the hypothesis."
Now, does this -- is this information from the files of the tobacco company important information to you?
MR. CURTIS: Objection to the form of the question, ambiguous.
THE WITNESS: Important information for me? None of it is new. I mean it's new in the sense that I have never seen this document before. It is -- it's not new in the sense that I would expect it to be found in this kind of document.
BY MR. ORENSTEIN:
Q. Say that again.
A. It's not new in the sense that I would anticipate that it would be found here.
Q. What do you mean by that?
A. If someone were providing a report, whoever is providing a report on smoking and lung cancer, whether or not this was from tobacco industry files,

or whether this was from researchers' files, or whether this was from some independent scientist who reviewed the literature associated with the data that's been collected regarding smoking, I wouldn't -- I wouldn't be surprised to see these statements. I would expect these.

Q. Okay. But your opinion isn't changed in any way?

A. No.

Q. Okay.

A. I agree with everything that -- there's nothing that I take issue with in the general sense. I'm not aware of anything that I've said that's at variance.

Q. Okay. You would agree that the evidence implicating smoking as being causally related to cancer of the lung is very strong?

A. As being related? I've taken issue with the word strong. I have some problems with that. Again, there is a -- there is a -- it's a very ambiguous word, the way we use it.

Let me just give you an example, taking from one of your own expert reports, where they cite the use of Vitamin A in a study of children and -- of which there are very huge numbers of children. And, in fact, in the two different groups there's relatively

small differences in the final numbers. But the differences are statistically significant. Okay.

So now the question is: Does this represent strong? Does it represent strong because P is equal to minus .100, whatever it is, or does it represent strong in terms of an understanding of all the variables that can -- that can be associated? That's my problem with the use of the word strong. Okay.

Q. You disagree with it?

A. I disagree with -- I don't have a problem. I have no problem with the idea that cigarette smoking has very strong statistical associations. I don't challenge those. What I challenge is all of the rest of the information that gets left out in those particular studies, that also have associations and that if we attempt, using a fairly reasonable statistical model to distribute the attributable risk across all the other risk factors, that we will see that smoking continues to have the same role that it's often purported to have. And I don't think you will find that. I think you'll find a very seriously diminished role.

Q. Doctor, my question was: Do you agree that the evidence implicating smoking as being causally related to cancer of the lung is very strong?

A. I agree in one sense --
Q. Yes or no?
A. No. All right. I'll say no. Okay. I mean I said in one sense I agreed. Strong in a pure statistical sense. Strong in terms of understanding the casual relationships, no.
Q. This sentence speaks to the causal relationship, doesn't it?
A. No. It speaks to the evidence. I miss -- I interpret the sentence completely different than you do.
Q. Why don't we go to the next exhibit.
Doctor, I'm handing you what's been marked as deposition number --
Could you read me the number, please?
A. Deposition Number 3116.
Q. Thank you.
This is an internal company document provided in the discovery in this litigation. It bears the Bates numbers 109938433 through 109938436. It's a document dated October 27, 1976, entitled, "Cigarette Smoking and Causal Relationships," and it's author is a gentleman named Green who was a scientist for the British --
A. Okay.

Q. -- American Tobacco Company, BAT Company.

Would you read with me on the first page, about fifteen lines down there's a sentence that starts, "The problem of causality has been inflated to enormous proportions"; are you with me on that?

A. Is it in the first paragraph?

Q. Yes.

A. "The problem of causality has been inflated to enormous proportions." Correct.

Q. It goes on to say, "The industry has retreated behind impossible demands for 'scientific proof' whereas such proof has never been required as a basis for action in the legal and political fields. Indeed, if the doctrine were widely adopted the results would be disastrous."

Do you agree with that?

MR. CURTIS: Objection to the form of the question. Compound and ambiguous.

THE WITNESS: Yeah, I'm not exactly sure what doctrine is being referenced here. I mean we're jumping into the middle of this paragraph and I'm not sure whether the doctrine refers to something above, or in the immediately preceding sentence, or what.

BY MR. ORENSTEIN:

Q. Do you agree that the doctrine that there must

be, quote, scientific proof, closed quote, whereas such proof has never been required as a basis for action in the legal and political field -- do you believe that doctrine, if widely adopted, would lead to disastrous results?

MR. CURTIS: Same objection.

THE WITNESS: If in fact that's what the doctrine has reference to, I'd probably take some exception to it.

BY MR. ORENSTEIN:

Q. How do you take exception?

A. I -- first of all, I do not take exception to the sentence, I think we've discussed this. The industry has -- whether the industry has retreated or hasn't retreated, I have no knowledge about this, behind, quote, impossible demands. I have no idea about impossible demands because I have no idea what demands the industry may have made with respect to it.

I can tell you what this scientist makes in terms of demands for scientific proof. Okay. And it says whereas such proof has never been required as the basis for action in the legal and political fields, and that for sure we act upon very incomplete data in legal and political fields. I don't

challenge that one bit whatsoever.

As a matter of fact, we vary -- we very often act on completely erroneous information. We've done this time after time. This was one of the things we were talking about the other day with respect to junk science. And some of the silly policies that the government adopts based on its own junk data.

Yeah, we very often in political and legal areas do things that are completely unsupported by even common sense, let alone the data.

Q. Let's go on. If you turn with me to the third page of the document.

A. (Complying.)

Uh-huh.

Q. This is the page with the Bates number -- the last three numbers of 435. In the second full paragraph Dr. Green writes, "For example," -- are you with me, where it says for example?

A. Yes.

Q. Second full -- second paragraph. "For example from the evidence we have that smoking is a factor in multiple correlations and is strongly associated with some diseases, this may be sufficient to substantiate a claim that smoking is a cause of the disease, or causes an increase in the incidence of the disease."

Do you agree with that?
A. I have no idea what "for example" refers to.
Q. Do you agree with the sentence?
MR. CURTIS: Objection to the form of the question.
THE WITNESS: I can't agree unless I know what --
MR. CURTIS: Objection to the form of the question. Vague and ambiguous.
THE WITNESS: I have no idea what example is and, therefore, I can't say whether I agree or not.
BY MR. ORENSTEIN:
Q. Well, the example is what follows.
A. No, I'm sure that it's not. I'm sure that the example has an antecedent here in the text above, which I have not read.
Q. Okay. Let's look at the next sentence. "If it can be reliably predicted that if smoking is decreased in a population, so will be the incidence of this or that disease, then smoking is a cause in the general or probabilistic sense"; do you agree with that?
A. Yeah. In a general or probabilistic sense, yes. This is, again, the separate meanings of the word. In which we have -- we have, for whatever

reason, not been permitted to look at.
Q. Do you agree that the evidence shows that people who stop smoking significantly decrease their risk of heart disease?
A. Do I agree that people who stop smoking reduce the risk of their heart disease?
Q. (Nodding.)
A. I agree that people who alter their behavior, which includes the cessation of smoking, alter their --
Q. That wasn't my question.
Do you believe that if smoking is decreased in the population, that the incidence of heart disease will be decreased?
A. I really don't have a basis for coming to a conclusion.
Q. You don't?
A. No.
Q. Do you --
A. I mean I was -- I was about -- I stated what my -- what my -- what my view is. Is that people alter their behavior, which includes a cessation of smoking, do I think that will change their risk? And the answer to that question is yes.
Q. I'm asking you just about smoking, not other

behavioral factors.
A. Okay. I don't have anything that documents that we can in isolation take precisely just that and alter precisely just that with respect to anybody's behavior and produce some particular effect. No, I don't.
Q. Do you believe that if smoking is decreased in a population that the incidence of lung cancer will also be decreased?
A. I'd go back to just what I said before. If one alters the behavior, with the cessation of smoking, okay?
Q. You understand --
A. Which includes multiple additional changes in people's behavior when they do that, do I think that it will change the statistics? My -- my answer to that is yes.
Q. Okay. But --
A. Do I think that it's been demonstrated that just that particular change in and of itself produces a result? The answer is no. I don't think it's been demonstrated. And, therefore, I don't -- therefore, I have no basis for believing that it would do that.
Q. Now, if you go on you'll see that Dr. Green makes a distinction which maybe you agree with. He

says that, going on to the next paragraph, "But the evidence obtained from populations is not relevant to the individual -- as far as the individual is concerned, general causality has no validity and it would be quite improper to imply predictability."

Do you agree with that?

A. Yeah. Yeah, I do agree with that.

Q. Do you agree with the distinction he makes that the evidence is sufficient to draw positive causal conclusions in the population, but not as to individuals?

A. I have not --

MR. CURTIS: Objection to the form of the question. That's vague and ambiguous.

THE WITNESS: I don't know what his -- what his -- I mean you are telling me that's what his view is.

BY MR. ORENSTEIN:

Q. Let me ask you your view.

A. Okay.

Q. Do you agree that the evidence that smoking plays a substantial part in disease in a population is sufficient to draw a causal conclusion, whereas such evidence is insufficient to draw the same conclusion as to individuals?

MR. CURTIS: Objection. Asked and answered in part.

THE WITNESS: Again, looking at the word causation, looking at it from the viewpoint of the experimental scientist, if I -- if I take the same lie and I tell the same lie a million times, it doesn't make it true. Okay? And until I know -- until I know -- and I'm not -- one of the things that I don't think is unreasonable at all, given the armamentarium that we have in modern science today, I think we are going to know. Okay? I think we are going to ferret some of these things out when people get around to doing the hard work of ferreting it out. I think we are going to understand those relationships. And maybe at that particular time I will admit to the possibility of a causation. But until that's actually demonstrated, I don't accept that. I don't accept that I can just take a population and say this happens, this happens, therefore it's causation. It's not causation. Okay? What we're talking about is a statistical inference drawn from a large set of data that demonstrates nothing with respect to causation that the pure scientist, looking for the mechanism, is going to accept.

BY MR. ORENSTEIN:

Q. Let's go to page four. If you look at the second sentence on page four.

A. Uh-huh.

Q. The author writes, "It may therefore be concluded that for certain groups of people smoking causes the incidence of certain diseases to be higher than it would otherwise be. But no valid conclusions may be drawn from the epidemiological studies with respect to any particular individual."

MR. CURTIS: Objection to the form of the question. Compound.

MR. ORENSTEIN: I haven't asked a question.

MR. CURTIS: Sorry, counselor.

Go ahead.

BY MR. ORENSTEIN:

Q. Do you agree with the first sentence I read?

A. I have a -- again, let me state my problem with that.

It -- what is it? Can you explain what it is?

Q. It is the conclusion that follows. Do you agree that for certain groups of people smoking causes the incidence of certain diseases to be higher than it would otherwise be?

A. May I ask the question: If it is not it -- is

not what follows, what is the therefore?

Q. By --

A. What is the therefore? I don't understand the therefore.

Q. Okay. I changed my question, --

A. Okay.

Q. -- since you have asked me to clarify it.

A. Okay.

Q. My question is: Is it your opinion that for certain groups of people smoking causes the incidence of certain diseases to be higher than it would otherwise be?

MR. CURTIS: Objection. Asked and answered.

THE WITNESS: Okay.

BY MR. ORENSTEIN:

Q. What's your answer?

A. What I've -- as I've answered previously, with respect to the word cause and that particular relationship, okay. When it says -- when it says that smoking causes the incidence of certain diseases to be higher than it would otherwise be -- that's not demonstrated.

Q. So your view on causation has not changed by seeing these documents --

A. No.

Q. -- from these scientists?
A. No, it's not.
And they're addressing, I believe, the epidemiological data.
Q. Do you agree that for the British doctors studied in the British doctors study, smoking causes the incidence of certain diseases to be higher than it would otherwise be?
MR. CURTIS: Objection to the form of the question. It's ambiguous.
THE WITNESS: Again, if you -- if you'd be willing to state which of those certain diseases. You said certain diseases. Which ones.
BY MR. ORENSTEIN:
Q. Lung cancer.
A. Lung cancer in particular?
BY MR. ORENSTEIN:
Q. (Nodding.)
MR. CURTIS: Objection to the form of the question. Ambiguous.
Which study are we talking about? I don't want to go any further than that, but --
MR. ORENSTEIN: The study -- thank you for allowing me to clarify.
The study that was marked as an exhibit

yesterday. Exhibit 3114.

THE WITNESS: And the question one more time? I'm sorry.

BY MR. ORENSTEIN:

Q. Okay. It's been a while since the question was posed.

Do you agree that in the population of British doctors studied in the research reported in Exhibit 3114, smoking causes the incidence of lung disease to be higher than it would otherwise be?

A. Smoking causes the incidence -- again, we're getting into causes the incidence of.

I don't believe this study has demonstrated it.

Q. I didn't ask whether the study demonstrated it. I asked if you believed that in that population that was true.

MR. CURTIS: Objection to the form of the question. Ambiguous.

THE WITNESS: I -- I would have no basis for independently making that assessment.

BY MR. ORENSTEIN:

Q. Where was that stack of exhibits?

MR. ORENSTEIN: Let's go off the record for a minute.

MR. CURTIS: Glad you did.

(Exhibit 3122 marked for identification.)

(Recess taken.)

MR. ORENSTEIN: Back on the record.

BY MR. ORENSTEIN:

Q. Dr. Wunsch, I'm handing you what's been marked as Deposition Exhibit 3122. This is a two-page excerpt from the 1996 Policy Compendium of the Florida Medical Association. And I'd just like you to read with me under the heading "Tobacco" on the first page. There's a heading, "Ill Effects of Primary, Secondary and Passive Cigarette Smoking."

Do you agree with the Florida Medical Association Policy Compendium that cigarette smoking has ill primary, secondary, and passive effects?

A. May I read it?

Q. Sure.

A. (Reviewing document.)

It's just this first paragraph?

Q. I just asked if you agree.

A. Agree what?

Q. That cigarette smoking has ill primary, secondary, passive --

A. That's not what the paragraph says.

Q. I'm asking if you agree with the underlying statement.

MR. CURTIS: Objection to the form of the question. Ambiguous.

THE WITNESS: I'm -- I cannot -- this is not a sentence, "Ill effects of primary, secondary and passive cigarette smoking." That is not a sentence.

BY MR. ORENSTEIN:

Q. You don't--

A. That's a subject.

Q. You don't agree, then, that cigarette smoking has ill primary, secondary, and passive effects?

MR. CURTIS: Objection to the form of the question. Compound.

THE WITNESS: I've told you areas in which I feel that there are -- that there are -- I think significantly demonstrable relationships to where people need to alter their behavior. And if one reads the paragraph that follows, in no way does it point to specific disease entities, et cetera. It's a policy statement, it's a political statement.

"The Florida Medical Association shall seek to make it clear to all our legislators in the state and those who represent us in the Federal Government, through direct contact and through the American Medical Association, that the lawmakers' cooperation and collaboration is necessary to make cigarette

smoking and availability as difficult and undesirable as possible in order to improve and maintain the public health and welfare. The FMA, its component societies, and by referral to the AMA, shall encourage burdensome taxes on the use of cigarette products in order to discourage smoking and also to make available funds for the treatment of those who have already been afflicted by cigarette-caused disease." One use. "Members of the FMA shall educate and encourage their staff, colleagues, and coworkers to the appropriate incentives and disincentives to surrender cigarette smoking completely, and every member of the FMA shall designate and post clearly signs that state that health care facilities, including private offices, are nonsmoking areas."

Okay. This is a public health pronouncement. We talked about public health pronouncements before. We talked about the positions that I -- and -- that I -- and do I disavow this and say these people are wrong? No, I don't.

BY MR. ORENSTEIN:

Q. Okay.

A. I think this -- this is not an inappropriate public health statement.

Q. Okay.
A. But that's what it is.
Q. I'd like to hand you what's been marked as Deposition Exhibit 3117.
MR. ORENSTEIN: Clyde, if I forget to give you a copy, just holler. I'm drowning myself in paper right now.
MR. CURTIS: That's okay.
BY MR. ORENSTEIN:
Q. This is a predesignated document entitled, "Smoking and Heart Disease." It's a pamphlet that was sent to me, if you look on the last page, by the American Heart Association in Miami, Florida.
A. Uh-huh.
Q. Would you turn to the first page -- I'm sorry. The second page of the document. Look at the last paragraph on that page. If you read with me. It says, "The fact is that more than four hundred thousand deaths in the United States every year result from smoking." Do you agree with that?
A. I think it's an outrageous statement. I disagree with it completely.
Q. Do you agree with the next sentence: "About 43% of them are due to cardiovascular disease"?
A. 43% of them.

Q. Of the four hundred thousand deaths in the United States every year that result from smoking --

A. I -- I disagree. Dramatically disagree.

Q. For the reasons you've expressed?

A. For the reasons that I've expressed.

Q. Would you look at the second-to-last page?

A. Page nine?

Q. Yes.

A. Okay.

Q. The section that says, "Why You Should Stop Smoking Now"?

A. Uh-huh.

Q. It goes on to say, "No matter how much or how long you've smoked, when you quit smoking your risk of heart disease starts to drop." Do you agree with that?

A. Again, as I've said before, and I would qualify this as to what I would agree with, is that when you alter your behavior, which includes the cessation of smoking, that it will change the risk and I agree, yes.

Q. But not smoking alone?

A. Not smoking alone. Absolutely not.

Q. What was that exhibit number? I'm sorry.

A. 3117.

MR. CURTIS: 3117.

BY MR. ORENSTEIN:

Q. Dr. Wunsch, I'm handing you what's been marked as Deposition Exhibit Number 3118. This is a fax I received from a Florida affiliate of the American Cancer Society. If you would just read the first paragraph with me.

A. Uh-huh.

Q. I'm sorry. Maybe I have the wrong one. Smoking Cessation? This is a fax I received from a Florida affiliate of the American Heart Association.

If you would read the first -- is that what was --

MR. CURTIS: 3118.

MR. ORENSTEIN: Thank you.

BY MR. ORENSTEIN:

Q. The first paragraph under the heading, "AHA Scientific Position: AHA Public Advocacy Position." The first paragraph sets forth conclusions from the 1990 surgeon general's report that eliminating smoking can bring a major reduction in the occurrence of coronary heart disease and other forms of cardiovascular disease. The report also states that quitting smoking reduces the risk of repeat heart attacks and death from heart disease by 50% or more."

Smoking cessation is important in the medical management of many contributors to heart attack--including atherosclerosis, thrombosis, coronary artery spasm, and cardiac arrhythmia--and of several other disorders, especially arteriosclerotic peripheral vascular disease and chronic obstructive pulmonary disease." Do you agree with that?

MR. CURTIS: Objection to the form of the question. Compound.

BY MR. ORENSTEIN:

Q. Is there anything in that paragraph you disagree with, Doctor?

MR. CURTIS: Same objection.

THE WITNESS: Smoking cessation it says is important in the medical management of many contributors to heart attack. And then it leads to all of these.

To the extent that the inferences that the smoking itself produces the result, I object. To the extent that the behavioral changes associated with smoking cessation have an influence on some of these things, I agree that to a certain extent it does. I think to the extent that's being attributed in these sort of studies, I disagree completely.

BY MR. ORENSTEIN:

Q. You've drawn a distinction in the deposition between scientific positions and public advocacy positions. Would you agree with the American Heart Association that the position it sets forth on this page is both a scientific position and a public advocacy position?

A. I believe it's a public advocacy position.

That it's a scientific position and they're attempting to do this because they've demonstrated it in any way, shape, or form, the scientific validity of what they are arguing? No, I don't think so.

Q. They're wrong?

A. I didn't say they're wrong.

Q. You said --

A. I'm saying that they didn't -- to the extent that they advocate this -- is it demonstrated? The answer is no.

Q. Are they wrong that this is a scientific position?

MR. CURTIS: Objection to the form of the question. Ambiguous.

THE WITNESS: It's a public health position.

BY MR. ORENSTEIN:

Q. Doctor, you didn't answer my question.

Are they wrong that it's a scientific position?

A. Are they wrong that it's a scientific position?

MR. CURTIS: I --

THE WITNESS: I have a real problem making a question out of that. I don't understand.

BY MR. ORENSTEIN:

Q. Okay. I'd like to hand you what's been marked as Deposition Exhibit 3119. It's a one-page document entitled, Cigarette Smoking And Cancer." This was faxed to me from a Florida affiliate of the American Cancer Society. I'd like you to read with me from the first paragraph, "What in cigarettes causes cancer? A number of substances in tar, and some in the gas phase are carcinogens (cancer causing). It has been scientifically proven that cigarette smoking is a major cause of cancers of the lung, larynx, oral cavity, and esophagus, and is a contributing cause in the development of cancers of the bladder, pancreas, pharynx, uterine, cervix and kidney."

A. Uh-huh.

Q. Do you agree with the last sentence I read, that it has been scientifically proven, that sentence? Do you agree with that sentence from this American Cancer Society document?

MR. CURTIS: Objection to the form of the question. Compound.

THE WITNESS: I disagree.

BY MR. ORENSTEIN:

Q. A Florida affiliate of the American Cancer Society is wrong?

A. Yes.

It's not a scientific organization.

Q. Doctor, I'm handing you what has been marked as Deposition Exhibit 3120. This exhibit is the deposition of Peter P. Rowell, R-O-W-E-L-L, taken August 26, 1997 in this action.

Would you please -- well, Dr. Rowell is one of the defendants' experts in this action, as you are.

A. I don't know. I don't know that.

Q. Okay.

A. Okay. You're telling me that.

Q. I'm telling you that.

A. Okay.

Q. That's a fact.

A. Okay.

Q. He was deposed on August 26, 1997 in this action, as you were deposed yesterday and are being deposed today.

A. Okay.

Q. If you would turn to page one eighty-six of the --

A. That's the little numbers?
Q. Yeah. You'll notice there are six pages on a page, so...
A. Yeah.
Q. Take you a second to find it.
A. Okay. I'm there.
Q. If you would read with me, starting on line twenty, from Dr. Rowell's deposition.
A. Uh-huh.
Q. "QUESTION: Let's talk about disease causation a little bit and let me define a couple of terms for you first so we're all using the same language.

"ANSWER: Okay.

"QUESTION: For purposes of my question I want to define causation as something which is a substantial factor in bringing about an event or harm. Using that definition, do you have an opinion as to whether or not smoking causes lung cancer?"

There's an objection from the attorney.

"QUESTION: Put another way, is it a substantial factor in producing lung cancer?"

Another objection.

"ANSWER: Well, it's not an area that I'm expert in, but my personal opinion is, with that definition of causation as a substantial factor, I

would agree with that.

"QUESTION: In both men and women?"

Objection.

"ANSWER: Again, it's outside my area of expertise, but from my knowledge I would agree with that.

"QUESTION: Is it a substantial factor in bringing about pharyngeal cancer?"

Objection.

"ANSWER: Outside of my area. I wouldn't disagree with it.

"QUESTION: Is smoking a cause of chronic obstructive pulmonary disease?"

Objection.

"ANSWER: Same answer, I would not disagree with that. It's outside my area, but it's a substantial factor.

"QUESTION: Is it substantial factor in heart disease?"

Objection.

"ANSWER: Again, I would agree that it's a substantial factor.

"QUESTION: Is it a substantial factor in oral or mouth cancers?"

Objection.

"ANSWER: With my understanding, it would be.

"QUESTION: Is it a substantial factor in the development of esophageal cancers?"

Objection.

"ANSWER: I would agree with that.

"QUESTION: Is it a substantial factor -- is smoking a substantial factor in stroke?"

Objection.

"ANSWER: Again, from my knowledge I would say that's correct.

"QUESTION: Is smoking a substantial factor in the development of emphysema?

Objection.

"ANSWER: I would agree with that.

"QUESTION: Is smoking a substantial factor in the development of arterial sclerosis?"

Objection.

"ANSWER: I'm less certain about that, but I would defer to the experts if that's the case.

"QUESTION: Is smoking a substantial factor in intrauterine growth retardation?"

Objection.

"ANSWER: I probably would agree with that.

"QUESTION: Is cigarette --

"ANSWER: It's not a marked effect, but --

"QUESTION: All right. Is cigarette smoking a substantial factor in the development of bladder cancer?"

Objection.

"ANSWER: That I don't know about. I wouldn't disagree if that's what the statistics show.

"QUESTION: Is cigarette smoking a substantial factor in the development of pancreatic cancer?"

Objection.

"ANSWER: Again, I don't know, I'm not an expert.

"QUESTION: How about kidney cancer?"

Objection.

"ANSWER: I don't know. I wouldn't disagree.

"QUESTION: Stomach cancer?"

Objection.

"ANSWER: I wouldn't disagree.

"QUESTION: Cervical cancer in women?"

Objection.

"ANSWER: I wouldn't disagree. I don't -- I don't know for sure."

Dr. Wunsch, do you agree with the answers given by Dr. Rowell?

MR. CURTIS: Objection to the form of the question. It's overly broad, ambiguous, and

compound.

THE WITNESS: No.

BY MR. ORENSTEIN:

Q. Okay. For the reasons that we've been discussing these last few days?

A. We spent quite a bit of time yesterday, as you'll recall, talking about that word substantive and again I'm just -- my understanding, and the way I use those particular words with respect to epidemiological data is there's two things: One meaning significance from purely statistical sense, and the other meaning magnitude; in other words, the size of the coefficient that somebody attributes.

Two different meanings of the word substantial. And I have to separate those things out in my own mind and to clarify those when I talk to others.

And none of that is separated out in this particular case.

And it wasn't separated out yesterday when we did this back and forth with the word substantial. You kept asking, and you turned it around, and you turned it upside down. And I kept responding and you kept feeling I wasn't responding to your question.

Q. Are you changing your answers you gave?

A. I'm not changing my answers whatsoever. I'm

being very consistent with that.
Q. Did you mean to clarify your answers from yesterday?
A. I'm attempting to clarify again. Because the same thing has come up this morning with respect to -- not the word substantial, I forget exactly what the word was, but it was significant or important, or whatever else -- one of those other words. And I -- and there are two different senses of those words when we look at epidemiological data.
Q. Tell me again what your distinction is that you're making as a clarification.
A. One is -- is with respect to the statistical probability that something in some sort of way is a factor. In other words, given the particular model, given the cohort, and given the particular term that's attributed to, quote, smoking, and we measure this and we measure the statistics associated with it and we calculate the probability that in fact what is attributable to smoking by the known hypothesis is zero, smoking is not a factor -- is a factor or is not a factor. Okay? And we can actually test within that statistical model for this particular -- for the particular cohort that it corresponds to, we can make a crude estimate as to probability. It's crude

because we make lots of statistical assumptions in attempting to come to a number, but I'm willing to concede some of those are not grossly unreasonable assumptions. And so we come to say, okay. It's P less than .001. Okay? In other words, is there anything -- is there something there greater than zero? All right. That's what it's saying about. As a statistical variant. Only as a statistical variant.

I'm perfectly willing to concede that somebody didn't screw up in their calculations of probabilities even though the model for doing those probabilities itself is -- is really not -- not terribly appropriate, but it provides ballpark-ish estimates.

And so, yeah, when you come up with something that's got the little tiny numbers, it's very significant, it's very substantive, if you want to use that word, as a variant. Okay.

Now, the question is -- okay. What about the coefficient -- we're now talking about the coefficient. What about the other coefficients in the regression that we're looking at? One is smoking, okay? I'm saying all right. Let's look at all the other variables that's necessary for us to

understand, as well as we can, given the inadequacies of the model and the fact that people are very nonlinear. Okay? Let's look at these other ones. Let's just not ignore them. Let's decide to try and understand them, given the limitations that we have to deal with, where we can't experiment with people. But let's just not ignore the other ones. And when we add all these additional variates, what is the relative magnitude of that particular coefficient that we attribute to smoking versus all of these other factors in this equation? And we take care to address all the other factors. Okay. Now how substantive is it? That's the -- that's the open question. That's the question that isn't answered. That's the one that I can't sit here for because good science hasn't been done on that particular issue.

Q. Doctor, I asked you yesterday -- Doctor, yesterday -- strike that.

Yesterday our discussion was that there can be more than one substantial factor.

A. There can be. You're saying that?

Q. Yes.

A. That's your definition of the word substantial?

Q. Yes.

A. Can there be ten substantial factors? Can there

be a hundred substantial factors?
Q. There can be more than one substantial factor.
A. Can there be a hundred substantial factors?
Q. Doctor, defining cause as a substantial factor in bringing about a particular harm, and further defining it that there may be more than one cause, do you agree that lung cancer is a substantial factor in bringing about the harm of lung cancer? Yesterday you said you couldn't agree with that.
A. That's correct.
Q. Do you agree with that today?
A. I don't agree with it today either because, again, we're looking at -- as I tried to -- when we -- we seem to be going around a little bit on this issue of substantial. Okay. I have no idea what you're -- which way you're using that. And I have to qualify it in one particular sense, as to whether or not -- whether or not it is a statistically-significant variate. Okay. I agree. It's statistically -- it is a risk factor. I don't challenge the fact that within each particular study where the -- where reputable scientists have taken the data and haven't misrepresented it in any particular way, that in fact that they -- that they say within the confines of that particular model,

yes.
Q. Doctor, I'm not asking you to compare it in order of magnitude to other things that may be causes.
A. You're not? Then I cannot answer -- then I'll have to say no. I have to say no. Because for me, if there's a hundred substantive things, and they're equally substantive, then one thing is 1%. And I don't think 1% can be substantive.
Q. I'm asking you about lung cancer and your opinion on lung cancer. I'm not asking you a hypothetical question about a hundred things of 1% each.
MR. CURTIS: Objection, asked and answered.
BY MR. ORENSTEIN:
Q. Yesterday I understood your answer to be that you couldn't state an opinion on the question of whether lung cancer was a -- played a substantial role in bringing about the harm -- I'm sorry. Strike that.
I understood your answer yesterday to be that you could not state an opinion whether smoking played a substantial part in bringing about the harm of lung cancer. Smoking being one of perhaps additional causes. Is that still your answer today?

A. That's still my answer today.
Q. Or is it your answer today that smoking is not a substantial part in bringing about the harm of lung cancer?
MR. CURTIS: Objection. Asked and answered.
BY MR. ORENSTEIN:
Q. Which is your answer?
A. My answer has not changed. Is that it's not demonstrated and, therefore, I can't say that it is. And my bias is that it's probably not.
Q. Okay.
A. When we understand -- when I think we fully understand it, I think we're going to find it has a much smaller role. Some people would call it substantive, I suppose. Other people would not.
Q. You do not? You don't call it substantial?
A. It's a very hypothetical thing. Because I use that word within -- within the association of assuming we have all the truth here.
Q. I --
A. Two different views.
Q. I wasn't clear whether you were trying to change your answer from yesterday.
A. No, I was not trying to change it. I was trying to say my answers today are consistent with what I

was saying yesterday.
Q. Okay.
A. Okay. And we got into that word substantial again.
Q. Let me hand you what's been marked as Deposition Exhibit 3121.
Dr. Wunsch, this is a transcript of a deposition of Stephen Goldstone, who is the chief executive officer of R.J. Reynolds Company. This is the transcript of a deposition that was taken in the Florida Medicaid recovery action on August 22, 1997.
I'd like to ask you to turn to page twenty-three and look at lines fourteen to fifteen. And read with me where Mr. Goldstone says, "...I do believe that today that cigarette smoking plays a role in causing lung cancer."
MR. CURTIS: I'm going to object to the form of the question. It's totally out of context. The question is broad and general.
THE WITNESS: I'm sorry, what line were we starting on? We're on page twenty-three, correct?
BY MR. ORENSTEIN:
Q. Yes.
Line fourteen.
A. Line fourteen. Thank you.

Q. Third word in, "...I do believe that today cigarette smoking today plays a role in causing lung cancer." Do you agree with that statement?

A. I agree he's not a scientist.

Q. What is your answer to my question, sir? Do you agree with the statement, "...I do believe that today that cigarette smoking plays a role in causing lung cancer"; is that your opinion?

MR. CURTIS: Objection to the form of the question. Asked and answered.

THE WITNESS: It's not my opinion.

BY MR. ORENSTEIN:

Q. Do you disagree with that?

A. Yeah.

Q. You disagree with the CEO of R.J. Reynolds?

A. Yeah. I agree he's not a scientist.

Q. Let's look at page twenty-five on line five.

"QUESTION: I take it, sir, do you accept that cigarette smoking is a cause of disease in humans?

"ANSWER: I will tell you, because I'm not a scientist, and I respect the views of your scientists at our company who very compelling explained to me why there are gaps in scientific knowledge. I've only been in this company a number of years. I was a smoker myself at one time and I've always believed,

rightly or wrongly, I have always believed that smoking plays a part in causing lung cancer. What that role is, I don't know, but I do believe it.

"QUESTION: Your answer to my question is yes?

"ANSWER: Yes, sir."

Do you agree with Mr. Goldstone that cigarette smoking is a cause of disease in humans?

MR. CURTIS: Objection to the form of the question, asked and answered.

THE WITNESS: I'm -- you're going to find a very consistent response from me, as many times as you want to ask this particular question.

The causation -- I'm putting on my experimental science hat here -- causation has not been demonstrated. I still don't believe it's been demonstrated. Until it is demonstrated, I don't believe that I can say that yes, I believe it's a cause.

BY MR. ORENSTEIN:

Q. Do you agree with Mr. Goldstone's testimony?

A. Do I disagree with his testimony?

MR. CURTIS: Objection to the form of the question.

THE WITNESS: His testimony is here.

MR. CURTIS: Overly broad and general.

BY MR. ORENSTEIN:

Q. Do you disagree with the testimony that I've just read from Mr. Goldstone?

A. Are you asking do I disagree with his conclusion?

Q. Yes.

A. I disagree with his conclusion.

Q. You disagree with him when he says that he accepts that cigarette smoking is a cause of disease in humans?

A. That's correct.

Q. Thank you.

MR. ORENSTEIN: Let's take a break.

THE WITNESS: I do agree with him, he's not a scientist.

MR. ORENSTEIN: Is there anything else you want to say? I wasn't trying to cut you off.

THE WITNESS: No.

MR. ORENSTEIN: Let's go off the record.

(Recess taken.)

BY MR. ORENSTEIN:

Q. Dr. Wunsch, --

MR. ORENSTEIN: Back on the record.

BY MR. ORENSTEIN:

Q. Dr. Wunsch, would you please turn to page six of

your report. Page six of Exhibit 3103.
A. (Complying.)
Q. In the -- on the last sentence of the first paragraph, would you read with me: "Also, smoking cessation reduces the risk for many of the diseases over variable lengths of time." Is that your opinion?
A. Yes. Again, we're talking about statistical risk factors here.
Q. In our previous discussion you drew a distinction between smoking cessation in and of itself, and smoking cessation in combination with other -- with changes in other behavior.
A. Uh-huh.
Q. Are you making that distinction here?
A. Absolutely. Absolutely. It doesn't -- it's not spelled out in the detail there, but that is -- that is a clear inference of mine in this case.
Q. That's not what it says.
A. Well, you know what happens is we don't qualify every word of the English language we use every time we use it.
Q. You didn't --
A. That's part of the reason why I'm here today, is to clarify that.

Q. You didn't write that sentence, did you?
A. I'm -- I'm sure that at some particular point I said something very substantially similar to that.
Q. Did you write it?
A. Did I write that particular sentence? I can't -- I can't for certain say yes or no.
Q. You had a chance to review this report, didn't you --
A. That's correct.
Q. -- before it was submitted?
A. That's correct.
Q. You read it carefully?
A. Yes.
Q. You had the opportunity to make any changes you felt were necessary?
A. Correct.
Q. And you took that opportunity?
A. I did.
Q. Doctor, I've asked you specifically your view on causation of lung cancer.
A. Uh-huh.
Q. But I want to ask you for the other diseases, just so we have it for the record. I think I know what your answer is going to be.
Is it your opinion, Doctor, that smoking --

Let me define my terms again. When I say cause, I mean a substantial part in bringing about a harm, and it can be one -- of more than one cause.

A. (Nodding.)

Q. With that definition of cause, is it your opinion that smoking is not a cause of pharyngeal cancer?

A. With that definition it is -- I do not subscribe that that -- that smoking is a cause of pharyngeal cancer.

Q. With the same definition -- you understand the definition?

A. I do understand what your definition is, yes.

Q. Do you understand -- well, okay.

With that definition, is it your opinion that smoking is not a cause of oral cancer?

A. Yes.

Q. With that definition, is it your opinion that smoking is not a cause of esophageal cancer?

A. Yes.

Q. With that definition, is it your opinion that smoking is not a cause of pancreatic cancer?

A. Yes.

Q. With that definition, is it your opinion that smoking is not a cause of kidney cancer?

A. Yes.
Q. With that definition, is it your opinion that smoking is not a cause of bladder cancer?
A. Yes.
Q. With that definition, is it your opinion that smoking is not a cause of chronic obstructive pulmonary disease?
A. Yes.
Q. With that definition, is it your opinion that smoking is not a cause of coronary heart disease?
A. Yes.
Q. With that definition is it your opinion that smoking is not a cause of stroke?
A. Yes.
Q. With that definition, is it your opinion that smoking is not a cause of peripheral vascular disease?
A. Yes.
Q. With that definition, is it your opinion that smoking is not a cause of peptic ulcer disease?
A. Yes.
Q. And with that definition, is it your opinion that smoking is not a cause of diminished health status, including respiratory morbidity and mortality?

A. Yes.
Q. Okay. Thank you.
Let's go back to the section of your report entitled, "Epidemiology."
A. Okay.
Q. You listed specific references for other sections of your report, but not for this one. I asked you yesterday if the Harrison's and DeVita texts were references for the sections of your report that were not specifically identified as having their own specific references and you said yes; is that the case?
A. No, I didn't say that was true for the case of epidemiology.
Q. Okay.
A. No, I didn't.
As a matter of fact, I think if we had that available to review, I think it would be clear. If it's not clear, then I misspoke, and I'll say that clearly now.
I'm not citing anything in either DeVita or in Harrison as a general reference for any of what I've espoused here for epidemiology.
Q. What are your references for this section?
A. Okay. My references, as I have said, associated

with this book, and as I said yesterday, and you would find if you were able to re-examine that deposition, that number one, I have -- I have taken -- some formal training in statistics. Number two, I have had -- my specialty, which is pathology, includes a certain amount of epidemiological study. Number three, I said that I had spent some time at the Harvard School of Public Health. That I worked with epidemiologists on some related computer programs. That -- number four, that I taught residents statistics, which included aspects of epidemiology and, in particular, how to carefully read scientific literature with respect to statistics, including scientific literature that is produced by epidemiologists.

I have said that I have -- as part of some of my publications, that I have used a number of statistics. I'm very often in -- when I collaborate in scientific work, have been asked to do the statistical analysis associated with those studies.

Q. Doctor, may I interrupt you for a second?

A. And so all of that is my background for saying that this is there. If it's necessary for me to provide you some reference in terms of statistics, I can do that.

Q. Okay. I wasn't asking you to repeat your testimony from yesterday.

A. Okay.

Q. I understood your general background.

The question is: The Court order requires that you identify the sources, the specific sources that you rely on. And I was wondering whether there was any specific articles, as you identified for other sections of this report, which you rely on for your opinion on epidemiology.

A. If I can go back to when it says that for my -- for my expert. I have -- there's an enormous -- most of what I have here I can provide you references for as far as texts are concerned. I mean I spent a large amount of time in graduate school -- a large amount of time -- if you'd like to have all the textbooks that I used in any of those courses for references, I'd be happy to provide you a listing of all those texts.

Q. No, I don't mean things that you carry around as part of your general knowledge. I mean something you looked up, and consulted, and relied on specifically while you were preparing this expert report --

A. There wasn't such a source.

Q. That's fine.

A. I'm sorry.
Q. That's all I need.
A. If that was your question, I apologize for having been so circumspect with my answer.
Q. No apologies necessary.
Now, you state that -- I'll find where this quote is. On the bottom of page three, the second sentence from the bottom.
A. Uh-huh.
Q. If you're reading with me, "Also, epidemiological studies may attempt to adjust for known confounders, but they cannot completely account for all the multiple risk factors which combine to determine the medical condition of each individual." That's your opinion, isn't it?
A. Yes, it is.
Q. Okay. Have you ever contributed to an epidemiological study which did not account for all unidentified risk factors?
A. Yes, I have.
Q. Which study?
A. Oh, in particular we were talking about the AIDS surveillance.
Q. Any others that come to mind?
A. I actually had a superficial role in the MRFIT

study.
Q. What was your role in the MRFIT study?
A. I'm trying to remember exactly what all I did in association with that right now, whether it involved enrollees in the study, or providing any additional laboratory data. Whether our particular laboratory was used for some of the assays that were -- that were -- that were measured on the enrollees in the Miami area. There was a cohort in that particular area. It's far enough back at this point, it's somewhat hazy. But I was very aware of the study at the time. The parameters associated with the study, and contributed in some way, directly or indirectly.

I am not an author on any of the MRFIT articles.
Q. Okay. To the best of your knowledge what was the Mr. Fit research project attempting to quantify or to address?
A. It was -- it was the -- it was one of the first major prospective studies, looking at a number of behavioral variables. It was a mister, by the way. I mean the multiple, whatever we call it, risk factor, whatever it was, intervention trials. It was a mister and, as a matter of fact, it's been criticized by all kinds of women's groups as being an example of sexist science because it's as if women

don't have risks. But it was -- it was well-intentioned. And the political motivation for it was to try and arrive primarily at an understanding of variables that influenced cardiovascular disease. That was really the primary focus of that particular study. And that was the primary data that was collected, was the data that was associated with cardiovascular problems.

Q. Why were you involved in that study?

A. Like I said, I'm not exactly sure whether I got involved with the -- with the sampling for -- and the enrolling of any subjects, or whether or not our laboratories were actually providing some of the -- some of the data. I don't recall.

I do remember that there were a number of biochemical parameters that were measured, including -- and I think that they were all done by a very standardized technique for measuring cholesterol and triglycerides, serum lipoproteins. There was a lot of dietary history that was collected, associated with that particular study. Smoking history. Exercise history. I think HDL was measured specifically.

Q. Did that study measure all unidentified risk factors?

A. I think the study attempted to measure any risk factor which at that time was thought to be a risk factor associated with cardiovascular disease.
Q. Did the study measure all unidentified risk factors?
A. No, it didn't. It didn't. That's the problem--when they're unidentified, you don't know what they are, so, therefore, you obviously don't measure it. I mean by your own definition, okay, they didn't do it. Okay. And the subsequent --
Q. Doctor, that was your phrase, not mine.
A. I'm sorry?
Q. I believe the phrase "unidentified risk factor" was your phrase, not mine.
A. What's that, sir?
Q. You state, "Epidemiological studies cannot account for all of the multiple risk factors which combine to determine the medical condition of each individual."
A. Yeah. I didn't say unidentified risk factors. I didn't use the word unidentified risk factors.
Q. You said it can't account for all the multiple risk factors.
A. That's correct.
Q. Did your opinion that epidemiological studies

cannot account for all the multiple risk factors which combine to determine the medical condition of each individual, inhibit you from offering your assistance to the Mr. Fits project?

A. None whatsoever.

Q. Did you feel that your assistance was valuable?

A. Again, I played a very, very minor role. And like I say, I'm even having trouble defining precisely what that is. I'd have to go back to look at the time. But I was -- I certainly was very supportive of the study, yes.

Q. Okay.

A. I mean philosophically supportive of it, et cetera. Scientifically supportive of it.

Q. Did you believe that the study could provide important information about the causes of heart disease?

A. I felt as though the study could help us understand heart disease, yes.

That it was going to provide the causes? The reason the study was conducted was we kind of thought we already knew the causes at the time the study was being done. The question -- as a matter of fact, that's where the intervention comes in, that is a part of that study. Is can we change anything? And,

if so, what do we see when we do change things? That was the objective, okay?

And -- but the idea that it was going to identify the cause -- that wasn't an objective of the study. Causes were presumably causes. Not really causes in -- but the factors -- the principal factors that were in some way or another related to eventual outcomes, we thought that a lot of those had been identified. We subsequently learned that there were other ones.

And then, when we get down to it on an individual basis, okay? Had Arthur Ashe been part of that study; had -- had James --

MS. HOENE MARTIN: Fitz.

THE WITNESS: Fitz.

Thank you.

-- been part of that study -- obviously those poor people had bad genes working for them and we would have never dealt with that on that particular basis. But that doesn't invalidate a public health approach to understanding -- and I'm using that word in the broad sense, understanding risk factors better.

BY MR. ORENSTEIN:

Q. Okay. Doctor, turning to page four of your

opinion. The second paragraph says, "For a number of diseases alleged to be associated with smoking, epidemiological data have reported weak associations with relative risks less than 2.0"; what's the basis for your statement that the relative risk of less than 2.0 is a weak association?

A. I think you'll find in some of your own expert reports the references to strong association, weak associations, and so on, with respect to this general idea of risk factor. That needs to be qualified. I'll apologize for having not gone into great treatise length dealing with all the qualifications that one needs to put around this. We're just picking a figure that is in the ballpark with a lot of areas where -- that are, quote, weak associations. This is the kind of number that often surfaces in the studies that purport some sort of association. And that's all -- there's nothing magic about two. As a matter of fact, this is -- uncharacteristically I should have struck out that point zero and just said two. Okay. Because two, three, one and a half, I mean, there's --

Q. The relative risk of 3.0 is a weak association, in your opinion?

A. You're getting down into the range where you may

be dealing strictly with confounders and absolutely no causal association whatsoever, even in particular cases where we know the cause of disease, we can find -- I can -- I can point you many, many papers where we know the cause and in fact we find confounders that end up with a, quote, risk factor, 3.9 or 2.9, yeah.

Q. Is a relative risk of 4.0 a weak association --

A. You know what happens if you want to just keep increasing the numbers...

It is more than two. Four is a bigger number than two. Okay?

Q. Well, tell me, Doctor, --

A. So it's stronger than two. Four is stronger than two.

Q. Okay. But you've described the language used in your report as perhaps needing clarification. I'm giving you the opportunity to clarify.

A. Okay. And I just hope that I did.

Q. What you believe is the upper bounds of a weak association.

A. What is the upper bounds of a weak association?

Okay. We're dealing with continuum, you understand? Okay. And because -- these numbers are generated with the assumption that you're dealing

with a continuum in the numbers. We're not dealing with integer quantities here. And so, you know, somewhere in the vicinity of, I don't know, somewhere between two and four, I'd say, okay. Yeah, that's kind of an upper bound.

Q. Okay.

A. For weak association. The way I would use the word weak.

Q. Uh-huh.

A. Weak is a qualitative word. Two is a number.

Q. The numbers that we've been talking about in the ranges, are you applying those to relative risks where there's not been attempt to control for other risk factors?

MR. CURTIS: I'm going to object to the form of the question, that it's ambiguous.

BY MR. ORENSTEIN:

Q. Do you know what I'm saying? Some studies --

A. I'm not real sure.

Q. -- control for other variables.

A. Yes.

Q. Multi-variable analysis?

A. Right.

Q. Am I using those phrases correctly?

A. I'll accept those words.

Q. Some studies may look at one factor?
A. Correct.
Q. And not account for any other demographic characteristic or other risk factor.
A. Uh-huh.
Q. In the discussion we've been having about your opinion about weak relative risks, are you referring to relative risks that are found when no other variables are controlled for? Or relative risks where other variables are controlled for?
A. Both. Let me explain.
Q. Why don't you clarify?
A. Okay.
Q. I think that's important. I want to hear it in your language, not mine.
A. When we have lots of other variates, which end up having meaningful associations, meaningful coefficients in our multiple regression analysis, and from those, then, we can assign risk factors associated with them, the more of those that we have, then -- then the less a number has to be in terms of its magnitude to be important, because if it's still there and if the probability still says that this is P less, whatever, whatever, whatever. Yeah, okay.
On the other hand, if we do a study where we

don't include any of those other things, and we end up with the same number two, for example, that's a much, much less meaningful two.

Q. Can you put any bounds on that? And what you mean by weak, and whether it's a multi-variate assessment?

MR. CURTIS: Objection to the form of the question. Ambiguous.

THE WITNESS: Let me -- can I -- can I go back and just continue with the thought before?

Is -- is -- to the extent that one has adequately included all of the variables that one believes to be significant variables, the -- you know, and probably, you know, you're getting around to where two -- I don't know. At that particular point I'd say, you know, maybe two a is a little bit stronger, certainly is definitely stronger than those cases where we don't have it -- don't have all that additional information. And the more -- okay.

Let me qualify this one last time. There is a statistic in multiple regression analysis which is called residual variants. Okay? To the extent that the residual variant is relatively small, than two may be a relatively -- relatively moderate, conceivably even strong association. In those

particular instances, independent of how many variets that we have in the analysis, where the multiple regression reveals that there's an enormous amount of unexplained variants, then even a five may be a weak association.

BY MR. ORENSTEIN:

Q. Looking at coronary heart disease, if you had a multi-variet equation that tried to estimate the relative risk of smoking and coronary heart disease and controlled for serum cholesterol and blood pressure, would a relative risk of two be weak?

A. If that's all that you control for, it would be weak.

Q. Okay.

A. Absolutely.

Q. Okay. What's the basis for your opinion that cardiovascular diseases in certain cancers have relative risks of less than 2.0?

A. The basis for my opinion that they have?

Q. Yes.

A. That kind of number is -- is seen in a number of studies that purport to show an association. We've talked about the Doll study as an example. He has a whole list of disease that has very -- relatively small numbers.

Q. What about cardiovascular disease?
A. Cardiovascular disease? What numbers do we have -- did he have in that particular study? I think his numbers were in the vicinity of somewhere between two to four. I don't have a specific -- I can actually -- I might be able to find those particular numbers.
Q. Okay. Doctor, I'm reading out of your report. You wrote -- you signed a report that said, "Various cardiovascular diseases have weak associations with relative risks, less than 2.0."
A. Uh-huh. Yeah.
Q. Am I reading that correctly?
A. That's correct.
Q. What were you relying on when you wrote that?
A. I'm not sure that I can add a lot beyond what I've already said. That studies that demonstrated -- that use -- that come up with this kind of a number, where they clearly have incomplete handling of the data, that I regard that as a very weak association. Okay. Are there studies that do that? Lots of them. I mean the number -- as an example, 2.0 may be, again, -- like I said, I don't know how many studies have come up with 2.000 as a risk factor, okay. On the other hand, in that vicinity of two

there are a number of facts -- a number of studies that have looked for a linkage between cigarette smoking and cardiovascular disease, that come up with a number in that vicinity. Some with less, some with more.

Q. But you conclude that those are weak associations?

A. Those are weak associations in my mind, yes, sir, absolutely.

Q. Did you look up any other studies before you signed your name to this report on cardiovascular diseases?

A. I have run across multiple of those studies, yes.

Q. Doctor, did you --

A. I didn't do that as a result of this, no. I didn't do that -- I didn't go look up studies to generate this particular report. That's background knowledge.

Q. But you agree that in a multi-varied analysis a relative risk of less than 2.0 could be strong?

A. It could by strong if in fact the residual variants from that particular model was very small, yes.

Q. Would you agree that the finding of relative --

would you agree that the finding of small relative risk should not be readily dismissed as due to chance or bias, but further explored by examining possible interactions with other risk factors --

Let me start again.

Dr. Wunsch, wouldn't be able to --

A. I was up with you.

Q. Do you agree that the finding of small relative risk should not be readily dismissed as due to chance or bias, but further explored by examining possible interactions with other risk factors for susceptible subgroups of the population?

A. I agree with that enormously. And I wish the State of Minnesota had agreed and adopted that approach when they attempted to assign economic damages in this particular case, and maybe I wouldn't be here if that were the case.

Q. Are you familiar with the surgeon general's criteria for establishing causation?

A. I believe I have read some statements of the surgeon general with respect to particular entities. I'm not sure whether or not I've read anything from a surgeon general that said this is my definition of causation.

Q. Okay. Would you turn to page seven of

Dr. Samet's report?

A. Uh-huh.

Okay.

Q. And let's read together the second paragraph. "Epidemiologic evidence is interpreted for causality according to criteria that provide a guide as to the strength of the evidence. These criteria have been applied to the epidemiologic data on smoking and health beginning with the landmark 1964 report of the Surgeon General'S Advisory Committee. The criteria are not rigid bench marks, but guideposts for evaluating the epidemiologic findings in a framework that also incorporates other relevant lines of health data. The main criteria include consistency, the strength of the association, the specific -- specificity of the association, the temporal relationship of the association, and the coherence of the association as listed in the 1964 report of the Advisory Committee to the surgeon general.

A. Uh-huh.

Q. Do you have any reason to believe that the criteria enumerated in that last sentence are not the criteria listed by the surgeon general in the 1964 report?

A. I don't have any reason for believing that --

they may not be listed in that particular way. Again, I haven't read the report for that particular thing. I'd be greatly surprised if they used precisely those words.

MR. ORENSTEIN: Okay. We can go off the record.

(Off the record.)

MR. ORENSTEIN: Back on the record.

BY MR. ORENSTEIN:

Q. Doctor, on page twenty of the 1964 report to the Advisory Committee to the surgeon general, the 1964 report says, "To judge or evaluate the causal significance of the association between the attribute or agent and the disease or effect upon health, a number of criteria must be utilized, none of which is an all-sufficient basis for judgment. These criteria include: A, the consistency of the association; B, the strength of the association; C, the specificity of the association; D, the temporal relationship of the association; and E, the coherence of the association."

So with those criteria in mind, --

A. Uh-huh.

Q. -- do you agree with those criteria?

MR. CURTIS: I'm going to object to the form of the question as requiring the witness to answer a

question that's being posed by reading it from a text that hasn't been introduced into evidence or shown to him. Results in the question being vague.

BY MR. ORENSTEIN:

Q. Dr. Wunsch, do you agree with the criteria listed in the last sentence of the second paragraph of Dr. Samet's report on page seven?

A. You'll notice there was a word that was in the surgeon general's Advisory Committee report. Okay. Did you -- did you understand that word sufficient?

Q. Well, --

A. Did you understand the word sufficient? Because I understand that word sufficient. Okay. That means that it is absolutely necessary that at least these criteria be met before we can regard the data as being very valid. Okay? Okay.

In other words, those particular -- they're not sufficient in and of themselves, and that's what it says, they're not sufficient criteria. And, in fact, they're not sufficient criteria. And I agree completely that they're not sufficient criteria. They are absolutely necessary criteria for epidemiologic data to even be considered to point in the right direction. Okay? That's what that is saying. And I agree with that.

Q. Doctor, it says no one of which --
A. No one of which. And to -- taken together is what they need -- they should need to add. Taken together is not sufficient. Okay. Not only is no one of which is sufficient, but taken together they're not sufficient. That's my very, very strong view.

You know, again, what happens is -- I want to go back to something I said before. And this is an immutable, philosophical, scientific, epistemological principle that I've adhered to every time I try and understand numbers. Okay? Is numbers never interpret themselves. It always takes people to interpret the numbers. Numbers don't tell you anything. Numbers -- we -- we make -- we generalize. We interpret. We conclude based on numbers. All right.

And what happens is -- what we're talking about here is a collection of numbers. And then the question is -- okay. What are the reasonable conclusions that we would necessarily have to -- to attach to those particular numbers if we were to ever impute causation? Certainly each one of those is a necessary condition before we would even attempt to impute costs.

But going beyond that, all we're saying is, yeah, this is consistent with the notion of causation. And we're saying that this particular data is consistent. Does it prove? It proves nothing of the sort. Is it possible that there are still confounders in spite of each one of those? The answer to that question is yes. Have we ever had instances in science where we've been confounded in exactly that way? The answer is yes, unfortunately we have. We've all been led astray.

Q. Doctor, if I told you that the surgeon general since 1964, and each successive surgeon general, that has published a report on smoking and health have used those criteria --

A. Uh-huh.

Q. -- in reaching determinations of causation, would your opinion be that those criteria are not sufficient?

A. Those criteria are not sufficient, yes, sir.

Q. Thank you.

Now, in your report section entitled, "Pathology" you say, among other things, "Toxicological data from laboratory experiments are needed to bridge the gap between epidemiologic evidence and a conclusion of causation"; correct?

A. Correct.
Q. Would you agree that toxicological data are not on the surgeon general's list as a necessary component before causation can be found?
A. They're not there. I mean I didn't see them listed there.
Did you? Maybe I -- maybe I missed something.
Q. What other things besides toxicological data do you think are needed?
A. Okay. Basically what happens is you can collect all the statistics you want to collect about the behavioral of billiard balls on a pool table, all right? Ultimately -- and some of which is ultimately going to require the application of statistics. Nonetheless, the underlying principle there is Newtonian physics that we're looking at. And there is no statistics in the world that are going to discover Newtonian physics.
For us to understand the role of -- and when we -- and we need to --
Q. Doctor, I --
A. -- get down to the molecular mechanism, all right, before we can impute causation.
Q. Doctor, what other things --
I'd like you to list them.

A. Okay.
Q. Not to give any lengthy narratives.
A. Okay. Good.
Q. What other things, besides toxicological data, do you think are needed to bridge the gap between epidemiological evidence and a conclusion of causation?
A. Besides epidemiological data? The -- we would need to know the various molecular mechanisms that are associated with mutations. We'd need to know the effect of mutations on the controlling genes. We would need to know the linkage between the compounds that people were being exposed to in -- from cigarette smoking and those particular mechanisms.
There's no statistics in any of that, by the way.
Q. Could -- would you please tell me what published literature you can cite that agrees with you that those things that you've enumerated, including toxicological data, and the other things I asked you to enumerate, are needed to bridge the gap between epidemiological evidence and a conclusion on causation?
A. I think that you'll find a large number of texts that deal with malignancy and mechanisms associated

with malignancy. None of them -- practically none of them refer to epidemiological data as being a cause of malignancy. They all look at the intimate mechanisms that are involved with those particular biological factors that I've just mentioned.

I mean how many references would you like?

Q. Would you name me a text that -- a general reference text that disagrees with the conclusion that smoking is a cause of disease in the American population?

A. That's -- that wasn't the earlier question. Do you want me to --

Q. Yes, I'd like you to answer that.

A. -- pursue the earlier question?

Q. No. I'd like you to answer the question I just asked you.

A. Okay. Can I cite a text?

I can -- I can do this with respect to text. I can -- I can show you texts which are very circumspect with respect to the way that we regard the epidemiologic data.

Q. Name me a text -- a general reference text you find reliable --

A. Okay.

Q. -- that does not agree that smoking is a cause

of disease --

A. I can't name one right now. I mean I have -- I have read with some care a number of texts, a number of papers, a number of monographs that deal with the subject matter, and find that there is two completely different standards--one is a scientific standard, where people look at and say, well, you know, we really -- do we understand causation with respect to cigarette smoking? I can say no. I can find others that say, oh yeah, we knew about that in 1950. We've known about the cause since 1950. Okay. So --

Q. Does Harrison's take a non-scientific approach?

A. Does Harrison's take a non-scientific approach? Harrison's is somewhat circumspect.

Q. Does Harrison's take a non-scientific approach?

A. Do they take a non-scientific approach? I'm not exactly sure. I would have to refer specifically to whatever you're -- whatever part -- Harrison's is a textbook, multi-authored textbook. Which particular section are we citing? Which particular chapter are we citing? Which particular paragraph? I'm not sure.

Q. Does Harrison's take a non-scientific approach to the question of whether smoking causes disease?

MR. CURTIS: Objection to the form of the

question. That's overly broad and general.

THE WITNESS: Again, I have no particular idea -- which particular chapter, which particular authors, which particular part of Harrison's you're referring to.

BY MR. ORENSTEIN:

Q. Let's go --

A. I think Harrison's is a reasonably balanced view as a general reference work.

Q. Let's go back to my former question, which is: Would you cite me any published literature that agrees with you that the things you enumerated are necessary to bridge the gap between epidemiological evidence and a conclusion --

A. I can't --

MR. CURTIS: Objection, asked and answered.

BY MR. ORENSTEIN:

Q. Tell me, please.

A. I can't give you one.

Q. Is it fair to say your opinion, though, obviously sincerely held, is out of the mainstream?

A. No, I don't think so.

Q. Why?

A. I think that there are a number of individuals who have a rather superficial understanding of the

process of life and the process of disease, who are perfectly willing to conclude causation on relatively superficial grounds. And to the extent that there are a large number of those, and there's a smaller number of -- of skeptical scientists who don't believe anything is proven until they know exactly what the underlying mechanisms are, I would be out of the mainstream.

On the other hand, there are a lot of skeptical scientists. Lots.

Q. On the question of whether smoking --

A. Yes.

Q. -- causes disease?

A. Yes.

Q. Would you name me some?

A. Name you some skeptical scientists.

If you wanted to look at individual diseases, I'd be happy to -- happy to provide you some references.

Q. How about lung cancer?

A. I'm not sure that I can give you a name associated with that.

I've talked to colleagues about this particular area. And heard them express views similar to mine.

Q. Who are they?

A. Who are they?
Q. Yes.
A. Some of the biochemists that I've worked with --
Q. Who?
A. -- in the past.
Specific ones? Gees. It's not the sort of thing that you -- that you sit down and say, ah, this person believes that. I don't even know what most people's religions are.
Q. You can't name me any?
A. Pardon?
Q. You can't name me any?
A. I can't give you a name right now. But I can tell you that I've had discussions with -- with a number of colleagues in the past and a number of people are very skeptical of the evidence in this -- as to -- when I skeptical of the evidence I'm talking about skeptical of the conclusion that we understand the underlying mechanisms, when we have a very superficial understanding of them.
Q. Can you name me another scientist who agrees with you that smoking is not a cause of lung cancer in the population of the United States?
A. Can't give you one right now.
MR. ORENSTEIN: Let's go off the record. I want

to mark a few exhibits.

(Exhibits 3123 - 3126 marked for identification.)

MR. ORENSTEIN: Okay. Back on the record.

BY MR. ORENSTEIN:

Q. Doctor, in your report on page four you quote from the 1964 report of the Advisory Committee to the surgeon general; am I correct?

A. Yes.

Q. And you say, "The production of bronchogenic carcinomas has not been reported by an investigator exposing experimental animals to tobacco smoke"; right?

A. Yes.

Q. Did you actually look at that 1964 report before filing your expert report in this case?

A. I did not.

Q. How did this get to be included in there?

A. I was aware of a number of -- a number of items in general that -- in the experimentals attempts to induce cancer in -- in animals. And so there were a large number of studies that existed, not just one or two. I would guess that perhaps there was upwards of twenty studies that had existed by that particular point, published studies. I remember attending

lectures and seminars where some of these studies were presented. And, therefore, this was -- this was relatively common knowledge at that particular point. And I know that the surgeon general didn't attempt to exclude any data that could be relevant and -- but the -- the actual citation of the year of the particular report -- I didn't have that. Somebody says, oh, that was 1964.

Q. Okay.

A. So that was provided to me, this information.

Q. Dr. Wunsch, you're using the surgeon general quotations from '64, '82, '83 and '84, --

A. Uh-huh.

Q. -- on pages four and five of your report as support for your view that toxicological data from laboratory experiments are needed to bridge the gap between epidemiological evidence and causation; isn't that why they're set forth here?

A. In part, yes.

Q. Why else are they set forth here?

A. They're set forth as pieces of information which are necessary, I think, to obtain an overall understanding of the disease processes. It doesn't mean that they are the only pieces of information that are necessary. So I didn't mean to exclude any

other pieces of information.

Q. I understand.

You would agree with me, wouldn't you, that in 1964 the Surgeon General's Advisory Committee and the surgeon general did not consider the sentence you quote as meaning that conclusion -- that a causal conclusion could not be reached on the question of smoking and lung cancer; wouldn't you agree with that?

MR. CURTIS: Well, I'm going to object to the form of the question. That's ambiguous.

THE WITNESS: Again, going back to what we spoke about in the beginning, this word cause, and perspectives and viewpoints with regard to the notion of cause.

We had a little episode that happened -- I'm not exactly sure whether it got here to Minnesota, just about a year and a half ago, where Centers for Disease Control, reacting to an outbreak of Cyclosporine that was becoming --

BY MR. ORENSTEIN:

Q. Well, --

A. Let me finish, please.

Q. Doctor, I'm asking you about the surgeon general's conclusion of 1964.

A. This is very relevant -- this is very relevant to the surgeon general's report.

Q. I'm asking you what the surgeon general found in 1964 about smoking and lung cancer?

MR. CURTIS: I'm going to object to the question in that if we're going to mark -- if we're going to talk about that document, we're going to mark it and put it into evidence.

BY MR. ORENSTEIN:

Q. Doctor, I'm showing you what's been marked as Deposition Exhibit 3123.

A. Okay.

Q. Okay. This exhibit is a cover page of the 1964 report of -- Report of the Advisory Committee to the Surgeon General of the Public Health Service. It's a two-page document.

On page one ninety-six, Dr. Wunsch, would you please read -- well, I'll read it. Page one ninety-six under "Conclusions." The first conclusion. "Cigarette smoking is causally related to lung cancer in men." Do you see that?

A. Yes.

Q. Okay. Dr. Wunsch, in 1964 did the surgeon general believe that the absence of toxicological data from laboratory experiments was needed to bridge

the gap between epidemiological evidence and the conclusion of causation regarding smoking and lung cancer in men?

A. From a political perspective, no. From a scientific perspective, absolutely.

Q. The surgeon general believed that?

A. The surgeon general is a politician. We discussed that before.

From a political perspective he didn't need it.

Q. How do you know what he meant from a scientific perspective?

A. I have -- as I said before, his qualifications are not one of a scientist.

Q. So you're just speculating about what his scientific conclusions were, aren't you?

MR. CURTIS: I'm going to --

THE WITNESS: I'm not speculating with respect to my understanding of the body of knowledge that existed at that time. I was a scientist at that time.

BY MR. ORENSTEIN:

Q. You're speculating --

A. I'm not speculating --

Q. -- about the surgeon general's conclusions, aren't you?

MR. CURTIS: I'm going to object to the form of the question because that misstates the witness's earlier testimony.

MR. ORENSTEIN: Okay.

BY MR. ORENSTEIN:

Q. Doctor, I'd like to show you what's been marked as Deposition Exhibit 3124. This is -- this exhibit is from the 1982 report of the surgeon general on The Health Consequences of Smoking. It's pages sixty-two and sixty-three of that exhibit.

Dr. Wunsch, you cite from the 1982 surgeon general report in -- on page four of your report, don't you?

A. Yes. I think it's '82.

Q. Did the surgeon general conclude, as you have, that toxicological data from laboratory experiments are needed to bridge the gap between epidemiological evidence and the conclusion of causation about cancer?

A. As far as I can determine from this, no.

Q. In fact, did the surgeon general even in the language that you quote in your report, discuss what he viewed as compelling evidence? That cigarette smoking causes cancer?

A. One more time.

Q. Read the last sentence of the part that you quote in -- on page four of your report from the 1982 report.

A. Uh-huh.

Q. Would you just read that out loud?

A. Okay. This is -- the sentence is -- begins with, "Neither rats, nor hamsters, nor baboons inhale cigarette smoke as deeply and as intensely as cigarette smokers who have provided that data with the consequences of their 'experiment' in the form of clinical evidence gathered by epidemiologists. In view of this compelling evidence, it appears that the experimental induction of bronchogenic carcinoma should receive limited priority as a research goal."

Q. The compelling evidence was the human, quote, experiment with smoking and lung cancer, wasn't it?

MR. CURTIS: I'm going to object to the form of the question because that's ambiguous.

THE WITNESS: The compelling evidence. The compelling evidence has to do with animals.

MR. CURTIS: Objection.

BY MR. ORENSTEIN:

Q. Doctor, why did the surgeon general believe that the experimental induction of bronchogenic carcinoma should receive limited priority from a research goal

from the information set forth by you in your report?
A. Why did he?
Q. Yes.
A. I think that what happened was that this is -- was rapidly turning to be a blind -- blind alley for research. Wasn't contributing in terms of an understanding of the mechanisms of the particular disease.
Q. Okay. Did you review the 1982 report of the surgeon general before including this information in your report?
MR. CURTIS: Objection to the form of the question. Asked and answered.
THE WITNESS: I don't have a specific recollection of having sat down with the data from the 1982 report and having gone through that.
As I had mentioned earlier yesterday, that a large amount of the body of the surgeon general's reports is abstracted and reported in various parts of medical literature. And so that I was, in general, familiar with the report.
BY MR. ORENSTEIN:
Q. Doctor, I'm handing you what's been marked as Deposition Exhibit 3125. This is a document with a cover page, "The Health Consequences of Smoking,

Cardiovascular Disease," a report of the surgeon general, 1983, and it includes pages six, seven, and eight of that report. Page two hundred and six of that report. And page fifty-six of that report.

A. Uh-huh.

Q. Doctor, on the bottom of page four you quote from this 1983 surgeon general report. Again, you did not sit down and review that report before your report was drafted; correct?

MR. CURTIS: Objection to the form of the question. Misstates the --

MR. ORENSTEIN: I'll --

MR. CURTIS: -- witness's earlier testimony.

MR. ORENSTEIN: I'll withdraw the question.

BY MR. ORENSTEIN:

Q. Doctor, the sentence that you quote from the 1983 surgeon general's report on the bottom of page four, you didn't actually sit down and read that sentence from that report before your -- in the period in which your report was being drafted and finalized, did you?

A. I did not abstract this particular reference directly from the unabridged text of the surgeon general's report, no.

Q. Okay. Did the 1983 surgeon general's report

conclude that the absence of toxicological data from laboratory experiments precluded the surgeon general from finding that smoking caused cardiovascular disease?

A. Apparently not.

Q. Okay. Doctor, I'd like for you to turn to page 206 of the report, which is the second-to-the-last page of this exhibit. And I'm going to read into the record the paragraph right above the boldface subsection. This is the paragraph beginning, "The variety of possible pharmacological" -- are you with me?

A. Yes.

Q. "The variety of possible pharmacological and toxicological implications of smoke and its constituents--and the absence of firm proof of what mechanisms are precisely involved in the unequivocal cause and effect relationship between smoking and cardiovascular disease--should not detract from our confidence in the epidemiologically and clinically irrefutable evidence of the cause and effect role of cigarette smoking in contributing importantly toward heart disease."

Dr. Wunsch, would you agree with me that that paragraph makes exactly the opposite point that

you're making in your section on cardiovascular disease and pathology?

A. I agree with that.

Q. Thank you.

Now I'd like to hand you what's been marked as Deposition Exhibit 3126. This is a report of the surgeon general, 1984, on chronic obstructive lung disease.

On the top of page five you extract a sentence from this 1984 surgeon general report. As with the other quotations in your report from the surgeon general report, is it also true here that you did not, when your report was being drafted and finalized, extract this sentence yourself?

A. I was aware for many, many years that we do not have a disease model of emphysema in animals. Number one.

Number two, we certainly don't have one that we can induce with cigarette smoking.

Q. Your answer to my question is you did not extract this sentence?

A. I didn't extract that. I knew that. That was, again, general knowledge. General information. It's true today.

Q. Doctor, did the surgeon general 1984 report

consider that the absence of toxicological data from laboratory experiments precluded the surgeon general from finding that cigarette smoking caused chronic obstructive lung disease?

A. Apparently not.

Q. Doctor, let's turn to the last page of the exhibit.

A. Uh-huh.

Q. If you look at the subsection there, "Cigarette Smoke."

A. Yes.

Q. Are you with me on page 277 of the report, which is the last page of the exhibit?

A. (Nodding.)

Q. Do you find in that paragraph the sentence that is quoted in your report?

A. (Reviewing report.)

I think so. Substantively. I'm not sure that it's identical.

Q. I think it's identical.

A. Okay.

Q. Is it important, Doctor, when you're setting forth citations to cite them in context?

A. Pardon?

Q. Is it important when you set forth citations in

a report, that you do so in context?
A. Yeah.
Q. Okay. Doctor, would you read the sentence immediately preceding the sentence that is quoted in your report?
A. Okay. "Cigarette smoking has been clearly identified as a major causal factor in the development of pulmonary emphysema in humans."
Q. And would you show me where that appears in your report?
A. It doesn't.
Q. Thank you.
MR. ORENSTEIN: Let's take a lunch break.
MR. CURTIS: Very good.
MR. ORENSTEIN: Off the record.
(Luncheon recess taken.)
MR. ORENSTEIN: Back on the record.
BY MR. ORENSTEIN:
Q. Doctor, we've just returned from a lunch break. While you were at lunch, did you review any documents?
A. I did not review any documents.
Q. You understand you're still under oath?
A. I understand that.
Q. Let's go back to your report, Deposition Exhibit

3103. It may not be on the top of your stack.
A. It's right here.
Q. Do you have it?
A. Uh-huh.
Q. On page five, the first full paragraph there under that 1984 surgeon general quote, you state that the animal skin painting --
A. Yes.
Q. -- tests --
A. Uh-huh.
Q. Reading from the last sentence of that paragraph, --
A. Yes.
Q. "Thus, this model tests the wrong substance, the wrong dose, the wrong route of administration, and the wrong organ and tissue."
What references can you cite or studies can you cite that agree with this criticism that you make?
A. I'm not sure and to some extent that one even needs to cite that. The -- this was -- this was a general -- there were a lot of these studies done at this particular time and this was a general criticism of almost all of those studies. I'm sure there's several references in the literature. If you need to have a specific literature reference for this, I

think I can find one for you.
Q. But sitting here today you're not aware of one?
A. I can't give you one right now.
Q. And you didn't look for one when your report was being put together?
A. No.
Q. Would you explain why in your view the toxicological assay of animal skin painting tests the wrong substance, the wrong dose, the wrong route of administration, and the wrong organ and tissue?
A. All right. Let's start -- the wrong substance.
We do not -- in any model that one would attempt to study the role of -- of tobacco tar, we don't apply tar directly to any of the bronchogenic -- any of the lining of the respiratory tract. It comes in contact with smoke. It doesn't come in contact with tar. So I think to say, well, you know, that this is the same thing -- anyone who would attempt to say we're looking at the same thing, smoke and tar are the same thing, this is the substance.
Q. Okay. I'm going to ask you a question about that before you go on.
A. Sure.
Q. Was the tar that was used in these experiments a condensate from tobacco smoke?

A. Yes, it was. At least in all the studies I'm familiar with.

Q. Why don't you go on.

A. Okay. The wrong dose. Normally biological responses -- that one should attempt to approximate an exposure or a dose with tissue that would be representative of -- let's just take an example of somebody who is a very, very heavy smoker. In fact, if you were to look at the concentration of the dose being applied to the tissue, you're probably looking at a factor of somewhere between ten and a thousand times the dose. This, by the way, is a -- is an often common thing that's done in studies. Is, hey, we start with something that's an extremely high dose, just to see if we get any effect at all. If we don't get any effect at all, we're wasting our time. But to generalize that information we need to make sure we get it down into the other doses.

Wrong route of administration. We're now looking at tissue which from a embryological viewpoint is radically different tissue, when we look at skin versus --

Q. Doctor, are you talking about number four now or number three?

A. I'm talking about number three.

Q. Okay.
A. Okay? The wrong route of administration. The route of administration in this particular case is painting. Okay. And it's painting on -- the painting on the skin, as opposed to -- as opposed to exposing to smoke or whatever the respiratory lining of the respiratory tract.

So these are -- these are all -- these are all differences and this is what this points out. Is that the animal model that was used is -- there are problems with extrapolating directly from that.

Q. Is it your opinion that the animal skin painting tests do not show that smoking causes cancer?
A. Well, they definitely don't show that smoking causes cancer. That for sure -- one could conclude that they don't smoke -- they don't show that it causes lung cancer.

Let me be a little bit more specific than that.

There are very, very limited numbers of cancers where one is ever attributed to smoking in the skin cancers. There have been lip cancers. But even in the area of lip cancers, generally speaking, it's not -- the mechanisms have not been clear whether or not it was direct exposure to tar, or exposure to the heat, or constant irritation, or exactly what the

mechanisms were.

Q. Do the animal skin painting tests provide important information to us --

A. Yes.

Q. How so?

A. If -- if absolutely no test on any animal of any kind demonstrated any potential to induce any kind of tumor, then it would -- then probably we don't even have them -- we don't even have an option, okay. It completely forecloses an option. We'll look to see whether or not we can go further. They opened a door, I think, to saying that, "Look there may be something here. You know, we can at least do something with respect to -- with respect to material taken from -- from -- taken from cigarettes."

I might add that those same kinds of studies have also been used for lots of other commercial products, including drippings from barbecue grills.

Q. Okay. Do the animal skin painting tests that were done on smoking point to causation?

A. They provide -- they provide evidence of a potential molecular linkage, a potential chemical linkage that, if pursued further, and that if in fact we can see -- the problem are -- the problem is we know and, as a matter of fact, what we have -- we

have some major, major problems that we've had with -- as an example, saccharin and the role of saccharin with respect to bladder cancer in rats. And there was an enormous amount of -- including some major changes in public health that -- as a consequence of those studies. And over time people have generally come to the conclusion that we were looking at a tissue and looking at a dose that couldn't possibly be extrapolated into the area of human exposure and that probably we couldn't come to the conclusion that, in fact, that we really caused cancer with the -- with the amount that people received.

Q. But I was asking you about the animal skin painting tests in smoking.

A. Sorry. Excuse me.

Q. The smoking tests do point --

A. They --

Q. -- to causation?

A. They provide a link, that -- that if it can be carried to further conclusion, that it could be data that would convince even a scientific skeptic.

Q. I understand your position. Thanks.

Let's go on to the next section, "Mechanism of Action." Still on page five.

A. Okay.
Q. You state in your report, "Another criterion for establishing causality is a demonstrated mechanism of action at the cellular or molecular level."
This is not one of the criterion required by the surgeon general, is it?
A. No. The surgeon general did not need that for his political responses.
Q. Okay. Would you please cite me to any other reference or article that lists a demonstrated mechanism of action at the cellular or molecular level as a necessary criterion for finding causation?
MR. CURTIS: Objection to the form of the question. Ambiguous.
THE WITNESS: Gosh. It's my view that an elementary biology text would require molecular mechanisms for saying that we have any -- any understanding of, quote, causation. I think this is the way we understand things at the biological level.
BY MR. ORENSTEIN:
Q. Would you cite me a textbook that says that?
A. Well, it tends to be the general -- I mean that's -- I think that that's general understanding among biologists.

Q. Okay.
A. I don't think I have a peculiar viewpoint on this.
Q. But I'm asking you to cite me a reference. Textbook, article, any reference.
A. I think that you'll find this is a main theme throughout the general references I've given, both DeVita and Harrison.
I mean there's enormous amount of emphasis on molecular understanding. Okay. And it's only through molecular understanding that we really appreciate the idea of causation.
Q. So in DeVita and Harrison's -- you would not find in DeVita and Harrison's that smoking causes any disease?
A. I didn't say that.
Q. You said that DeVita and Harrison's would agree with you that a necessary criterion for establishing casualty is a demonstrated mechanism of action at the cellular or molecular level?
MR. CURTIS: Objection to the form of the question. Misstates the --
BY MR. ORENSTEIN:
Q. Okay. If I misunderstood you, would you please correct me?

A. Another criteria for establishing causality is a demonstrated mechanism of action at the cellular or molecular level. Okay? That's what it says. Okay. To think that this is at variance with 99% of all of our understanding of biology and medicine, I think would, you know, -- I don't -- I don't know whether I could find precisely these words, but this is the underlying fundamental scientific principle.

Q. Dr. Wunsch, would DeVita's or Harrison's state that smoking causes cancer?

A. They -- it's conceivable that they might.

Q. If they stated that, could they possibly agree with you that a necessary criterion for establishing causality is a demonstrated mechanism of action at the cellular or molecular level?

A. I think that both of those people would completely agree with that. I think it would be very difficult to find a scientist that didn't agree with this.

Q. Would you name one, please?

A. Pick one. And I will say I think that one would agree with it.

Q. Okay. Would Luther Terry agree that this was a necessary criterion?

A. That's not what this says. It says, "Another

criterion for establishing causality is a demonstrated mechanism of action at the cellular or molecular level."

I can tell you, Luther Terry, among other people, encouraged an enormous amount of research in attempting to understand at the molecular level what this is.

Q. But --

A. And the sentence that follows, "Mechanisms by which smoking may result in various diseases have been proposed, but haven't been proven."

In other words, those molecular linkages, to a large extent, while there may be some hints in the direction, they're far from being established. We really don't understand that yet.

Q. Okay. But, Doctor, you testified that this was a necessary criterion, that smoking -- that causation could not be established in the absence of this criterion being satisfied. Is that your opinion?

A. It is my opinion that a scientifically sound, and I mean that, scientifically sound; in other words, convincing to a basic scientist, whether causality has been demonstrated, will require us to understand the molecular mechanism. In almost all cases.

Q. Okay. In the case of smoking and health?
A. In the cases of smoking and health.
Q. Would you name me another scientist who agrees with that?
A. Name you another scientist? We talked about this before. There are -- I'm sure there are many thousands of them that are out there, that agree with that as a principle.
Q. That it's a necessary criterion to finding causation in the area of smoking and health?
A. Yeah.
Q. Would you name me one, please, --
A. Okay.
Q. -- besides Christian Wunsch?
A. Besides Christian Wunsch?
I can't give you names of other individuals at this particular point. I know that there are many of them that espouse that particular viewpoint.
Q. Okay. Doctor, moving on, you discuss --
A. Would you like for me to collect some?
Q. In the context of this proceeding we just can't -- I can't answer your question.
A. The reason I'm asking -- my answer to the question is that I'm absolutely positive I can pull several reputable scientists and without difficulty

be able to produce a list of names for you.

MR. CURTIS: You are just here to answer the question.

THE WITNESS: I understand. But I mean I can't name one, but I could certainly produce them very easily.

MR. CURTIS: Your answer is you can't name one.

THE WITNESS: Yeah.

BY MR. ORENSTEIN:

Q. Doctor, moving on.

You discussed in the second paragraph under "Mechanism of Action" -- you discuss the concept that cigarette smoke is a complex mixture of compounds that may have additive, synergistic, or antagonistic effects when present in different combinations. What did you mean by antagonistic effects?

A. One of the -- whenever one takes a complex mixture -- believe me, tar is a very complex mixture of compounds -- you can actually have one compound neutralize the chemical activity of another compound.

One of the things that's pointed to as an example in the itemization of -- of compounds that have been identified as, quote, carcinogens in --

in -- extracted in Samet's report, -- gee, I just hit the page -- there's several compounds, a few of which are aldehydes. These aldehydes in the presence of a means, such as ethylamine, which is also one of the compounds which is cited here, end up tending to neutralize each other and, therefore, being antagonistic in terms of the mechanism of action.

In other words, either compound in isolation will produce a result; put together they produce a different result. And in this case an antagonistic result. In other words, rather than being synergistic, being antagonistic.

Q. Is it your opinion that the interaction of the compounds in cigarette smoking actually protect against cancer?

A. Gee, I haven't really entertained that as a possibility -- direct possibility.

Do I think it's possible that some compounds? Yeah, I think it's possible. As a matter of fact, it's probably a certainty. There's so many compounds.

Q. Is it your opinion that the interaction of the compounds in cigarette smoke may actually protect against cancer?

A. I'm sorry. I'm going to have to ask you one

more time.
Q. Sure.
Is it your opinion that the interactions of the compounds in cigarette smoke may actually protect against cancer?
A. May? The possibility, yes.
Q. In your report you state in the second sentence of the second paragraph under "Mechanism of Action": "The surgeon general has identified forty-three individual compounds in tobacco smoke that are carcinogenic in animal models."
A. Uh-huh.
Q. Do you agree with the surgeon general?
A. That these compounds have been isolated? Yeah. And as a matter of fact they're itemized here in -- I think on pages forty-six and forty-seven of the second part of Samet's report. Yeah.
Q. So you don't take issue that there have been identified forty-three individual compounds in tobacco smoke that are carcinogenic in animal models?
A. No, I don't take issue with that.
I might add--some of those compounds are naturally produced by the human body.
Q. And by that you -- do you mean that we should conclude that it's healthy to ingest more of them?

A. No.
Q. What did you mean?
A. Well, what I mean is that -- is that the idea that these are carcinogens and, therefore, that they're only found in tobacco smoke, or only in this sort of products; in other words, they're completely foreign and, therefore, we've been able to show in this particular instance we can cause with these particular compounds some sort of cancer in some sort of an animal. Okay. The fact is that probably virtually none of the cancers that humans experience are related to some of those compounds because we're constantly exposed to low concentration of those compounds. And if they were highly carcinogenic, we would have all been dead from cancer a long time ago.

And so this is the problem with itemizing things, sticking it on a list and saying you find this, therefore, -- okay. There is no therefore in this particular case.
Q. Do you have a list of the forty-three compounds?
A. I have a list that -- I think I've had the complete list. I said that they were here. On whatever that page was. And it turns out that I think I see thirty-seven of them isolated here.

Q. Okay. Well, let's stick with the thirty-seven.
A. Okay.
Q. Would you point to any of those which you would say for a pack-a-day smoker the person is exposed in a low concentration --
A. Would I --
MR. CURTIS: Objection to the form of the question. Ambiguous.
BY MR. ORENSTEIN:
Q. Dr. Wunsch, you testified -- you used the phrase low concentration --
A. Okay.
Q. -- when referring to the presence of certain carcinogens --
A. Yeah.
Q. -- occurring naturally in the human body.
A. Yeah.
Q. Which carcinogens on the list -- that's on page what?
A. Forty-six, forty-seven.
Q. Forty-six and forty-seven of the Samet report. Which of those result in a low concentration exposure for a person who smokes a pack of cigarettes a day?
A. I don't know the precise concentrations for acetaldehyde and formaldehyde. Both of those

compounds are produced in natural normal metabolism and probably produced in amounts greater than what a pack-a-day smoker would be exposed to.

Q. Other than those two, which ones?

A. Well, my -- my sandwich was wrapped in vinyl chloride the other day. The -- my coffee cup was a polyurethane cup. I mean we're exposed to these compounds in our routine, day-to-day existence.

Q. That wasn't my question, Doctor.

You referred to exposure naturally occurring in the human body.

A. Yes, and those particular two --

Q. In the human body?

A. And those particular two -- I cited those two.

Q. Okay. Any others?

A. Not that I would -- not that I could state at this particular time. I think it's altogether possible that there's a couple here that would fall in that category.

Q. Which do you think are possible?

A. I think the ortho-anisidine. I think the -- the 2-naphthylamine would be compounds that we could be exposed to under ordinary diets, ordinary circumstances. I don't think either of those compounds are direct metabolic metabolites.

Q. You think we could be exposed to them in our normal human interaction to a greater degree --

A. Than a cigarette smoker? Absolutely.

Q. -- than a pack-a-day cigarette smoker?

A. Uh-huh.

Q. Okay. Doctor, let's move to the next section, "Smoking As A Risk Factor For Diseases."

The fourth sentence of the first paragraph, "Many of these associations are weak and subject to error bias..."

Are you reading with me there?

A. Yes, sir.

Q. Which diseases were you referring to when you say that the associations were weak?

A. We mentioned several of those before. The cardiovascular relationships. The aortic aneurysms. The peptic ulcer. Those are all examples.

Q. Any others?

A. Any others? Yeah, several of the malignancies.

Q. Which ones?

A. Bladder cancer. Pancreatic cancer. Those come to mind right now.

Q. What do you base your opinion on for those diseases you've enumerated?

A. Why do I think that the linkage between the

risk factors, as cited in numerous studies for those particular malignancies, is a weak linkage?

Q. You said many of the associations are weak. What do you base that on for those diseases you've enumerated?

A. I base that on the risk factors that have been in published studies.

Q. Did you review any of those articles in the preparation of your report?

A. I mean I have reviewed lots and lots of articles in the past regarding those particular diseases. There's many, many citations of those within your own expert --

Q. Would --

A. -- reports.

Q. Would you cite me one as we sit here today?

A. Samet.

Q. What -- where does he say that the associations are weak for those diseases you --

A. That's my interpretation of the risk factors that he cites in this study.

Q. That's your interpretation?

A. Yes.

Q. Would you cite me a reference for that, please?

A. Reference for my interpretation?

Q. Yes. We're here to learn about your opinions and the basis for your opinions.
A. Okay. I think I can find one. It's going to take a little while. In Samet.
As a matter of fact, it won't take too long.
MR. ORENSTEIN: Let's go off the record.
THE WITNESS: Because we covered this in earlier testimony.
(Off the record.)
MR. ORENSTEIN: Back on the record.
BY MR. ORENSTEIN:
Q. Go ahead.
A. Okay. We were talking about epidemiological evidence. And we talked about the strength of the evidence. And we talk -- and we've talked about the magnitude of risk factors. Okay. These are terms which are utilized by Samet and by the surgeon general in their reports.
I think automatically by reference to this is a strong association, that in cases that are the adverse of that, it must mean there's a weak association.
I meaning I think it's fair to interpret those studies in that way and those citations in that way.
Q. So you're citing Dr. Samet for the proposition

that the association between cardiovascular disease and smoking is a weak association?

A. I'm saying that the risk factors elucidated in studies that -- that have been cited by Samet and others, indicate a relatively loose association, yes. A weak association.

Q. And I've asked you to cite to your references. I've asked you several times. If you're unable to, I understand that. But I need for you to answer the question.

A. I think I responded to the question earlier when we discussed the magnitude of risk factors and the particular studies and the range at which I regard as being weak and whatever. And -- and if you -- if you want, I would feel reasonably comfortable that we could find similar information in texts of epidemiology.

Q. You can't cite one to me today?

A. No.

Q. Which diseases were you referring to when you say that the associations were, quote, subject to error?

MR. CURTIS: I'm going to object to the form of the question in that it misstates the exhibit.

BY MR. ORENSTEIN:

Q. Okay. Let me read the sentence: "Many of these associations are weak and subject to error bias." I didn't include the word bias.

Which diseases were you referring to when you said that the associations were subject to error bias?

A. The same ones that are weak.

Q. Okay. And what are your references for that?

A. What are my references? The articles themselves. The studies themselves.

Q. Which studies?

A. That have been cited.

Again, I'll repeat, most of the studies associated with cardiovascular risk factors. Many of the studies that are associated with very weak statistical association and -- of the malignancies that I just cited.

Q. Can you name me one article?

A. Can I name you one article? I'm citing the -- I'm citing some of the same data that is referred to in these reports.

Q. Doctor, there were no references --

A. Okay. If up want -- I'll cite Doll's paper. You want a reference? Doll's paper is a reference.

Q. The forty-year study?

A. Yeah.
Q. Okay. Any others?
A. The studies referred to therein.
Q. Okay.
A. And practically every epidemiologic study that exists in this area. I'll cite them all.
Q. Doctor, you state that in your report that for many of the diseases there is, quote,"...confounding to such an extent that any relationship to smoking is highly uncertain and the idea that a quantitative relation to causation can be established is entirely specious."
Which diseases were you referring to?
A. Some specific instances are peptic ulcer disease. I think that this is an absolutely classic example of -- of data confounding where we now understand that disease. We know the underlying mechanism of that disease. And to purport that -- that cigarette smoking causes peptic ulcer is -- is -- I think is an extraordinarily loose word of the use cause.
Q. Is it your opinion that it's highly uncertain that there's any relationship between smoking and peptic ulcer disease?
A. That there's any relationship between the two?

I didn't say that. I'm talking about causal relationships.

Q. There's two parts to the sentence. Let's brake break them down?

A. Okay.

Q. The first part is that there's "...confounding to such an extent that any relationship to smoking is highly uncertain..."

A. Yeah.

Q. Which diseases were you referring to there?

A. Among them, peptic ulcer.

Q. Which else? Which other ones?

A. I think certain cardiovascular problems. Things like aortic aneurysm. Again, I think probably -- I think pancreatic cancer.

Q. Any others?

A. Colon cancer. I think that these are all examples to where -- to where there are so many confounding variables and there's been so little attempt to segregate out those confounding variables, that easily the confounding variables themselves could account for all of the differences.

Q. Any other diseases?

A. No. I mean I'm sure there are others, yes. Nothing that comes to mind right now.

Q. What about "...the idea that a quantitative relation to causation can be established is entirely specious"; which diseases were you talking about there?

A. I'm sorry. I need to read that with you.

Q. That's fine.

A. "The idea that a quantitative relation to causation being established is entirely specious" -- okay.

I regard the entire argument cart blanche of the State of Minnesota with respect to the quantitative assessment of the relationship of causation and damages, as totally specious.

Q. For every disease mentioned in your report?

A. For every disease that's mentioned there. Absolutely. Unqualifiedly every disease.

Q. What's your reference for that?

A. We talked about how flawed the approach is. I think that -- I could drag any scientist in off the street and say is this an acceptable way to come to an idea of quantitative understanding and I think anybody -- anyone who happened to have even passing familiarity with the idea of statistics would say, no, this is complete specious.

I mean how can you quantitate this -- the

assessment of saying, oh, yes, um, 64% of the disease is due to smoking.

Q. Okay. What's your reference for that?

A. Common sense. Common sense. I can't go much more beyond that. I don't think one needs more references than common sense in that area.

Find me one scientist that would contravene what I just said.

Q. My job, again, is not to argue with you, Doctor.

A. I understand.

Q. My job is to find out the basis for your opinion.

So if you don't have a reference, that's fine.

A. Okay. I don't have a preference.

Q. Okay. I'm not challenging you on that.

A. It's not a published --

Q. I'm just trying to find out the basis of your opinion.

A. I understand.

MR. CURTIS: Answer the question he asks. If the answer is you don't have a reference, that's the answer.

THE WITNESS: I don't have a reference.

BY MR. ORENSTEIN:

Q. Doctor, you state that the Minnesota Medicaid population may have risk factors, including poorer diet, alcohol and drug abuse, occupation exposures related to blue-collar employment, urban environmental pollution, indoor air pollution, and inadequate medical care or compliance.

MR. CURTIS: Objection to the form of the question. It misstates the exhibit.

BY MR. ORENSTEIN:

Q. Well, let's back up.

The third sentence of the second paragraph on page six says, "Also, the Medicaid population may have multiple risk factors associated with lower socioeconomic status." Reading on it says, "For example, these risk factors may include poorer diet, (higher fat and lower in essential nutrients) alcohol and drug abuse, occupational exposures related to blue-collar employment, urban environmental pollution, indoor air pollution, and inadequate medical care or compliance."

A. Uh-huh.

Q. Have you ever done a study of the Minnesota Medicaid population?

A. I have not.

I'm referring to the data that's cited by the

State of Minnesota in their expert report.
Q. Which data?
A. The data in the expert report of Zeger, Wyant and Miller with respect to the model that was used to quantitate the relationship of smoking to economic damages.
Q. Okay. And that's your source?
A. Yes.
Q. Okay. The next sentence states, "The medical records in the depositions of the Medicaid recipients selected in this case suggest that members of this group are exposed to lifestyle and living conditions that result in more risks for various diseases."
Do I remember correctly that you testified yesterday that you had not reviewed any medical records?
A. That is correct.
Q. Or depositions?
A. That is correct.
Q. What's the basis for your statement?
A. The basis of that statement was discussion with counsel.
Q. You didn't ask to verify that?
A. No.
Q. Okay. Why?

A. Because it fit with my understanding of those kinds of records.
Q. What kinds of records?
A. The records of Medicaid recipients. The medical records of Medicaid recipients.
Q. What's your understanding of the medical records of Medicaid recipients?
A. I work in a hospital. I read medical records on a frequent basis. 43% of the population in my hospital are served by Medicaid.
Q. So for your purposes it's acceptable to draw conclusions about Minnesota population Medicaid recipients based on a population from another state?
A. They certainly said that that was okay to do this in your expert report.
Q. I'm asking about your opinion.
A. And I think that one can make that kind of generalization, correct.
Q. Would that be true about Medicaid recipients nationally?
A. There's variation. Obviously, from a completely quantitative viewpoint, there are differences. I didn't attempt to quantitate. These are qualitative assessments.
Q. Doctor, on page six you list a number of

occupational exposures that you associate with lung cancer.

A. Uh-huh.

Q. Do you see those in the second paragraph under "Lung Cancer"?

A. Yeah.

Q. Is it your opinion that the occupational exposures you list there on page six are sufficiently associated with lung as to call into question the strong association between smoking and lung cancer?

A. Do I -- I'm sorry. I missed that syllogism.

Q. It was a question.

A. Okay.

Q. Is it your opinion that the occupational exposures you list on page six are sufficiently associated with lung cancer as to call into question the strong association between smoking and lung cancer?

A. I'm sorry. I don't see any relationship between those two. I -- I don't see how -- how they could call -- call into question -- I mean, in those particular instances in which they're the cause of lung cancer, then presumably tobacco smoke is not the cause of lung cancer.

Q. Is there a strong association between smoking

and lung cancer in the epidemiological literature?
A. There is a stronger association in some of these environmental studies.
Q. You didn't answer my question.
A. Your question one more time.
Q. Is there a strong association in the epidemiological literature between smoking and lung cancer?
A. Yes. Yes.
Q. Do the occupational exposures you list on page six sufficiently -- do you find that they're sufficiently associated with lung cancer to call into question the strong association between smoking and lung cancer?
A. I don't --
MR. CURTIS: Objection. Asked and answered.
THE WITNESS: I don't understand how these particular factors could call into question the association. So I guess the answer to that is no.
BY MR. ORENSTEIN:
Q. So what's your point, then, in listing other risk factors that are associated with lung cancer?
A. In some of these cases I think we go beyond risk factors. We have a number of these instances, something that comes a lot, lot closer to direct

causation. And that's, I think, the primary point.
Q. Okay.
A. I mean I can take these particular compounds and I can reproducibly produce malignant disease with these compounds.
Q. Are you trying to make the point that because you find an association between these occupational exposures and lung cancer, that the strong association you've described between smoking and lung cancer is unreliable?
A. No, I'm not -- I'm not stating that.
Q. Okay. What about the risk factors you list in the next paragraph? Advancing age, prior lung scars or diseases, positive family history, and diet?
A. Uh-huh.
Q. Genetic factors?
A. Uh-huh.
Q. Do the associations that you find in the medical literature between those factors and lung cancer call into question the strong association between smoking and lung cancer?
A. They don't call into question, no. They're confounding factors.
Q. Is that the point you're trying to make?
A. That's the point I'm trying to make.

These are factors that no one attempted to adjust for.

When we assume that we've got this population of Medicaid recipients, and they're normal with respect to all the other recipients, non-Medicaid recipients, except for smoking, and then we attribute some particular facts that are associated with the smoking. And none of the other factors exist.

Q. Are you aware of any literature where the author of a study reported on research that attempted to control for occupational exposures in examining the relationship between smoking and lung cancer?

A. There are studies. I can't cite them right now, but there have been a number of studies that have been done in that way.

Typically what happens is they look at the smokers and the nonsmokers within the area of the occupational exposure.

Q. What did those studies conclude?

A. Some of those studies indicate that there may be a synergistic relationship.

Q. What does that say about the confounding effect of occupational exposures?

A. What does it say about the confounding effect? Is that obviously whenever there's any kind of -- any

kind of a synergistic effect we're talking about confounding, aren't we? And to the extent that the state doesn't even -- decides to totally ignore the presence of any confounding variables, says a lot.

Q. If they're synergistic --

A. It says we've sort of selectively decided not to deal with the truth.

Q. If -- if the effect of synergistic -- does that mean that in tandem they add to each other?

A. That's correct.

Q. Isn't the point you're trying to make about confounders, that confounding factors subtract from the reported influence of smoking on a disease?

A. No.

My -- the reason for bringing this up, the fact that confounding can happen both ways, is -- is that -- as an example: How is it that you're -- in those particular cases where, let's say, confounding is because of an occupational exposure, how is it that you can hold tobacco companies responsible for all the disease when in fact you know there are other factors that are important? That's the -- that's -- that's what -- the point of bringing this up is. That's the argument.

Q. The question is whether cigarette is a

substantial contributing factor, if there could be other substantial contributing factors? Isn't that what you mean when you say that one or more risk factors may have synergistic effects? That they both contribute substantially --

MR. CURTIS: Objection to the form of the question. It's confusing.

THE WITNESS: The way I understand the question is: Within the context of what I'm saying here, what we're talking about, how flawed the quantitative model is; is that when, in fact, there are environmental variables, which we know to be significant factors, and we don't attempt to adjust for those in attempting to come to a quantitative assessment of relationships, we're being scientifically dishonest.

BY MR. ORENSTEIN:

Q. You are familiar with published research that does control for the effects of occupational exposures and still finds a very strong relationship between smoking and lung cancer, aren't you?

A. I mentioned that there are studies -- a number of studies that have been done with respect to environmental exposures where one of the -- one of the ways they break the population down is the

smokers and the nonsmokers.
Q. What do those studies find, Doctor?
A. Some of the studies demonstrate, like I said, a synergistic effect.
Q. Are you aware of studies that find a strong independent effect of smoking on lung cancer controlling for occupational exposures?
A. There probably are some. I would imagine there were some given the huge number of studies that have been -- that have been conducted. I can't cite specific ones.
Q. You don't agree with the conclusion, though?
MR. CURTIS: Objection, form of the question. Confusing and ambiguous.
BY MR. ORENSTEIN:
Q. Doctor, do you agree that after controlling for occupational exposures, smoking still is a very strong independent risk factor --
A. Yes.
Q. -- for lung cancer?
A. Yes.
Q. Do you agree that after controlling for the other risk factors that you list under lung cancer, that smoking is still a very strong independent risk factor for lung cancer?

A. Yes.
Q. So why is it that you do not agree that smoking plays a substantial part, even after having controlled for all the risk factors you've identified in bringing about the harm of lung cancer?
MR. CURTIS: Objection. Asked and answered.
THE WITNESS: Yeah, I'm not sure that I can add a lot more to what I've said here. If you want me to rephrase some of the things I've said before. I mean you're asking how can I not. I've tried to explain my -- my understanding and the logic that I use in separating the -- the fact that I have a -- a relationship where we haven't attempted to adequately deal with the quantitative aspects of it. Then I find it very, very -- and in the absence of an underlying physical mechanism that irrefutably demonstrates some sort of a means by which -- I mean I'm even willing to accept the fact of mechanism by which it's likely that tobacco smoke causes cancer. I'm reluctant to embrace that idea and the reason is I've seen science -- I've seen public policy be wrong too many times with that. You know, we don't -- scientifically we don't determine the truth by democracy, okay?
BY MR. ORENSTEIN:

Q. What is the mechanism by which cigarette smoking is likely to cause lung cancer?
A. What is the mechanism by which it's likely to cause it?
Q. (Nodding.)
A. If it causes it, we will ultimately be able to demonstrate a molecular mechanism. We'll be able to demonstrate the particular compounds within tobacco. We'll be able to demonstrate some variation that we see in epidemiological results with respect to those particular molecular mechanisms. We'll be able to do all of that.
Q. Okay. Doctor, --
A. If, in fact, cigarette smoking ends up being the primary factor.
Q. Doctor, is it your opinion that there's an incidence of metastatic cancer that's misdiagnosis is primary lung cancer, sufficient to call into question the strong association between smoking and lung cancer?
MR. CURTIS: Objection to the form of the question. Ambiguous.
THE WITNESS: There is a sufficient percentage of misdiagnosed secondary malignancies, such that there would be an impact of many, many millions of

dollars on what the State of Minnesota is attempting to allege as responsibility for smoking-related disease.

BY MR. ORENSTEIN:

Q. How many millions of dollars?

A. How many millions? At least in the tens, perhaps the scores.

Q. How have you calculated that?

A. From the model that was used by Zeger, Wyant and Miller.

Have I -- I asked for some data, some quantitative data, because there's very little quantitative data in here with respect to how -- here it is, here it is. Hang on, hang on. This wasn't available to me initially, but it's right here now.

And if we look in this particular section with respect to -- with respect to the quantitative breakdown according to the major disease classification, and if we look specifically at what the state is purporting to recover for lung cancer, I see a figure here of three hundred eleven million dollars on page -- chart 2 A. I'm not sure I have a page number at the back.

Q. I've got 2 A.

A. Okay. All right. Now, if we're looking at a

number of diagnoses of lung cancer that can be demonstrated to be in error by somewhere between 25 and 50%, we'd be looking at somewhere between seventy-five and a hundred fifty million dollars.

Q. Okay. Thank you.

Is it your opinion that misdiagnosis of the histologic type of lung cancer occurs sufficiently to call into question the strong association between smoking and lung cancer?

A. No.

Q. Is it your opinion that --

A. It does occur, but it would have a relatively minor impact.

Q. So is it your opinion that the risk factors that you list under laryngeal cancer on page seven of your expert report are sufficiently associated with laryngeal cancer to call into question the association between smoking and laryngeal cancer?

A. I'm going to respond no, in the same way that I did with respect to the previous --

Q. Histologic type of lung cancer?

A. Oh no.

You asked that same question with respect to lung cancer.

Q. Yes.

A. And I said no. And I'm saying that for laryngeal cancer.

Q. Okay. How about oral cancer? Is it your opinion that the risk factors that you list under "Oral Cancer" on page seven of your expert report are sufficiently associated with oral cancer, as to call into question the association between smoking and oral cancer?

A. It calls into question the quantitation that the State of Minnesota has attempted to use in these particular areas. So when you're talking about the association, if the association is the association being represented by the State of Minnesota in the allegation of how much of the damages are due to smoking? Yes. Okay. Otherwise, no.

In other words, in a purely qualitative sense, no. In a quantitative sense they are very important areas because, again, we're talking about millions here, right? And relative to my income, that's a lot.

Q. Have you calculated the amount by which you believe the State of Minnesota has overstated its damages claim for oral cancer?

A. For oral cancer? No, I have not.

Q. Do you have a ballpark figure in mind?

A. I don't think that that was broken down in the -- in your expert report. They don't break that down. So I have no idea what that particular -- what those particular damages being sought are.

Q. Okay. Turning to esophageal cancer on page seven of your report. Is it your opinion that the risk factors you list under esophageal cancer are sufficiently associated with esophageal cancer, as to call into question the association between smoking and esophageal cancer?

A. I'm going to respond again: If we're talking about in the quantitative sense, I think they are significant confounding variables. I think on a pure risk-factor basis that these factors can account for substantial amount of the variants in the model and, therefore, for assignment purposes they're very important. Does that eliminate the possible role of cigarette smoking? No, it does not.

Q. Does it call into question the association between smoking and esophageal cancer?

A. It does not eliminate a relationship, no, it does not.

Q. Does it call it into question?

A. It calls the quantitative relationship into question. I'm going to just make that as my blanket

response to all of these items, if you want to continue in that fashion.

Q. Same thing for pancreatic cancer?

A. The same thing for pancreatic cancer. Even more so.

Q. It does not call into question the --

A. Even more so. From a quantitative viewpoint.

MR. CURTIS: Go ahead and let him ask his questions --

THE WITNESS: I apologize.

MR. CURTIS: You have to listen to the words he's using.

THE WITNESS: I know. And I do apologize.

BY MR. ORENSTEIN:

Q. Do the risk factors that you list under pancreatic cancer on pages seven and eight of your report -- in your opinion are they sufficiently associated with pancreatic cancer as to call into question the association between smoking and pancreatic cancer?

A. As we proceed to malignant disease, which has a weaker and weaker association as a risk factor -- risk factors cited in multiple studies become smaller and smaller. My tendency to say that it begins to call into question, is more and more yes, it does

call into question.

From a quantitative viewpoint, even more so it calls into question any attempts to assess a separate smoking-related economic damage based on risk factor.

Q. As to pancreatic cancer, would that be your answer?

A. That's my answer.

Q. What about kidney cancer?

A. Same.

Q. It calls into question --

A. Yes, it does.

Q. -- the association?

A. It calls into question much more so. Both on a quantitative aspect and a qualitative aspect.

But it does not eliminate any potential role. I'm not saying that it eliminates any potential role. It just calls more and more into question.

Q. There is still a role, even taking into account the --

MR. CURTIS: Object to the question, ambiguous.

THE WITNESS: There is a possibility of a role, yes.

BY MR. ORENSTEIN:

Q. Even taking into account the risk factors?

A. Even taking into account the other risk

factors. There's the possibility. I don't think that it excludes it.

Q. What about bladder cancer?

A. This was one of those -- the kidney cancer, the bladder cancer, the pancreatic cancers, these particular malignancies -- these are the areas where we have very weak associations. And to the extent we have other known factors that are confounders, or other causes, other established causes, let's put it that way, of malignant disease, yeah, they could cause more into question. It does not eliminate a possibility, in my mind.

Q. What about chronic obstructive pulmonary disease? Is it your opinion that the risk factors you list on page nine are sufficiently associated with COPD as to call into question the association between smoking and COPD?

A. It calls into question the quantitative relationship. It does not eliminate the qualitative relationship.

Q. The qualitative relationship as you've been using that term?

A. It is a risk factor. Smoking continues to be a risk factor. In other words, the amount that could be accounted for as a residual variant by these

factors would still leave another amount that could be reasonably attributed to smoking.

Q. Smoking is a very strong independent risk factor for COPD, is it not?

A. Again, when we talk about COPD, we're talking about a wastebasket of diseases. COPD is a -- is not a disease, a single entity.

If we're looking at -- pick one of them for me and then we'll discuss that.

Q. You used the term in your report.

A. I know I used the term in my report.

Q. Why don't you answer the question as you use the term?

A. As I use the term -- it's somewhere in between the areas that we were talking about before. There still is a risk factor. These additional causes, additional causes -- these established causes end up being confounders that are not adjusted for in any of the quantitative model, but they don't eliminate the potential for a role of cigarette smoking as a risk factor, as a potential etiologic factor.

There is, in other words, an association with smoking as a risk factor that probably would defy most attempts at isolating it. But then I always call into mind that there's a lot of ignorance we

have with respect to these disease prospects and the possibility that there are other more important risk factors, does exist. It's an interesting different disease. Doesn't strike most people in the same way.

Q. Would you agree that as -- with lung cancer smoking is a very strong independent risk factor for COPD?

A. I have a -- as with lung cancer, no. It's definitely a much -- in my mind, much weaker association because we have other established mechanisms by which -- I look at smoking as being more or less a contributing complicator.

I mentioned earlier that -- that individuals who demonstrate particular sensitivity to tobacco smoke -- for those particular individuals you can do an experiment. Take them on, put them off, whatever else it is. Their own control, if you will. And for those particular patients there is a definite relationship to the progression of their disease if they smoke. As -- as a -- as a behavioral trait. The mechanism, the underlying mechanism, and to what extent we can separate out and sort out and assess responsibility for that, difficult problem.

Q. Would you agree, Doctor, that it's extremely rare for a nonsmoker to have COPD?

A. Oh, no, no. Not at all. That's not extremely rare at all. Huh-uh.

Q. Do you have in mind a percentage of the population of people with COPD in the United States who are nonsmokers?

A. Are we including asthma here?

Q. How did you mean to include it?

A. I normally include asthma with COPD.

Q. Okay. Answer it how you might then.

A. But -- it's important here -- I said includes bronchitis and emphysema. I didn't say it -- I called it -- recalled saying here that it excludes -- pulmonary symptomatology may overlap --

I have made a distinction here with asthma, so I'm excluding that now in terms of my response.

Q. Okay.

A. I would agree that the great majority of people who are diagnosed with -- with the diseases emphysema and chronic bronchitis are smokers.

Q. What if you included former smokers? Would the number go up?

A. Would the number -- in terms of the total number?

Q. Yes.

A. Or the percentage?

Q. The percentage.
A. Yes, the percentage of all patients, if you included former smokers, it would go up.
Q. If you took smokers and former smokers would you agree that the incidence that -- that it's extremely rare in the United States for a person to have chronic bronchitis or emphysema if they are a never smoker?
MR. CURTIS: Objection to the form of the question. Ambiguous.
THE WITNESS: And I'm going to respond to that. No, it's not. I think you'll find there is very, very marked differences between some of the industrial cities in the north, with respect to chronic bronchitis and emphysema, and that you'll find in some -- that it's not at all something approaching rarity that you have these diseases in those cities.
BY MR. ORENSTEIN:
Q. What about in Minnesota?
A. I would think that it would be less common in Minnesota.
Q. Would you say it's extremely rare?
A. I don't -- I really don't have specific knowledge of whether it would be extremely rare or

not.
Q. Would you agree that it's rare?
A. It would be rarer than it would be in Pittsburgh.
Q. Okay. What about cardiovascular diseases? I'm asking the question for each disease because you -- you seem to be drawing some distinctions among diseases based on your own understanding, so --
A. Okay.
Q. -- I'll continue on.
Is it your opinion that the risk factors that you list under cardiovascular diseases on page nine are sufficiently associated with cardiovascular diseases as to call into question the association between smoking and cardiovascular diseases?
A. I think that they account for a major amount of the variance that we see in cardiovascular disease; therefore, they do call into question the relationship of smoking as an etiologic factor in smoking -- in cardiovascular disease.
Q. As a risk factor?
A. They don't eliminate it as a potential risk factor, but they grossly minimize it.
Q. Do you dispute that smoking is a risk factor for diminished health status?

A. You know, that's a term that I had never encountered until I read Samet's report.
Q. Well, you use it -- you do say it's rather vague.
A. Yeah.
Q. Tell me what you understand it to mean, since you devoted two paragraphs of your report to it.
A. I think that the relationship, if you wanted to couch it with respect to the way that you did, that the data regarding, quote, diminished health status, and the -- the relationship -- I mean we have a little different thing here that we're talking about, all right? Is all of a sudden we're no longer talking about specific disease. We're saying how much other health problems can we blame on tobacco? That's really what we're saying. So we're just going to ignore -- we're just going to say how many other economic costs? How many other things can we blame on tobacco? And -- and I regard that as a rather bizarre attempt of dealing with human behavior. And I think very, very little economic damage can be independently assessed to be due to the -- to -- due to tobacco as the, quote, diminished health status.
Q. Can you assign a percentage to your view of very little?

A. Could be as little as zero.
Q. What's a reasonable range in your opinion?
A. What's a reasonable range?
MR. CURTIS: I'm going to object to the form of the question. It's ambiguous.
THE WITNESS: Vis-a-vis what?
BY MR. ORENSTEIN:
Q. Well, your -- you stated that --
A. I --
Q. You stated that --
A. How can we have diminished health status due -- when we presupposed tobacco has caused diminished health status, okay? And then I've said that could be as little as zero. And then you're saying is it possible tobacco may have any other diminished health status? Is that what you're saying?
Q. Well, you said that very little of the costs of diminished health status could be attributed to smoking.
A. Yeah.
Q. I'm trying to get your sense -- a fair range of very little.
A. Let's flip that around. Are there any instances in which tobacco enhances the health status of individuals?

Q. Well, --
A. And do we admit -- because that's the only way in which we can deal with this issue. For me, the only way I can deal with the issue is to say -- if we're talking about the role -- other than with these specific illnesses -- the role of tobacco with diminished health status, we have to allow for the possibility of the role of tobacco with enhanced health status.
Q. What's your view on whether unbalanced, the use of tobacco enhances or diminishes health status?
A. What would be my guesstimate? As to which side of the --
Q. What's your view? You raise the issue. I'm asking for your opinion.
A. It's a really interesting one. I think that there are probably specific instances of both. And the question is, where does the weight fall in between in terms of our overall economic model? Maybe -- maybe on the side of tobacco cause rather than tobacco alleviated.
Q. Okay. What would be your view of a reasonable range of a low -- of a very low amount, as you've described it, netting out what you might consider to be any positive effect that could be fairly

attributed on the cost side of smoking? Percentage of all the diminished health --

A. If we were taking the total number of dollars that State of Minnesota is seeking in this particular instance, and forget about -- I don't know what the actual number of dollars are with respect to --

Q. Sure.

A. -- with respect to this particular argument? What would I be thinking of? What would I guesstimate that if we allowed for all the proper balances? At most 1%.

Q. 1% of the total dollars or --

A. 1% of the total dollars.

Q. 1% of the amount of dollars in diminished health status?

A. I don't see -- I don't see how 1% can be the total dollars. What are we talking about? How can 1% be total dollars. Total dollars is 100% within that particular area.

Q. Okay.

A. If you're talking about 1% of the overall claim, maybe, --

Q. What about a percent --

A. -- conceivably could go associated with that.

Q. What about a percentage of the amount of the

overall claim that isn't attributable to all these other diseases, but just attributable to diminished health status, respiratory morbidity and mortality? It would be some greater number, greater than 1%?

A. I'm not sure I'd put much more of a number on it than that.

Q. What's a reasonable range? Up to 5%?

A. Could it be up to 5%? That would be an absolute over-the-top mark for me, anywhere around that. And unless -- and unless studies were done, like I said, to make sure that one factored in any of the smoking-alleviated problems, that -- and I think if one were to do that appropriately, that one -- definitely you're not going to get up to a 5% figure.

Q. Is 4% the top of a reasonable range in your opinion?

A. I don't know. Maybe in that vicinity. Something like that.

MR. ORENSTEIN: Let's take a break. And then we'll be in my last segment here.

Clyde, are you planning to do any examination?

MR. CURTIS: No.

(Recess taken.)

MR. ORENSTEIN: Back on the record.

BY MR. ORENSTEIN:

Q. Doctor, just picking up on where we left off, you were trying to quantify what you thought might be a reasonable range of a very low number with where cost could be assigned to smoking for diminished health respiratory morbidity and mortality.

Is it fair to say that although you have very, very strong concerns, criticisms, and reservations about the plaintiffs' damage model and the way --

A. Yes.

Q. -- the experts go about quantifying those costs -- is it fair to say that even acknowledging those concerns, or crediting those concerns, that smoking is still a net cost to the Medicaid program in Minnesota?

A. Yeah.

Q. Okay. Can you give a range of reasonableness as you did with diminished health status?

A. I'm sorry. I really can't do that. I would like to be able to do that. I would desperately like to be able to do that. If I could do that, I'd publish several papers very, very quickly.

If you're asking my opinion as to where I think if you were to take -- not me, but somebody out there that's just a statistician, doesn't know anything about disease, and just says, okay, these are all the

confounders that may be in this sort of thing, maybe we have disease green and disease purple, let's not talk lung cancer and COPD, whatever else it is, we have these particular influences, how do you think the data would sort out given this study looking at this study with the green thing, with age and sex, and this -- and this thing over here looking at whatever, taking all the data and putting all the data into some sort of model. And you could attempt at some sort of quantitation.

Two -- two things. Number one, making all of the reasonable adjustments. In my mind I look at smoking as being a behavior. I mean some people look at smoking as being a physical thing, I mean, you know, you're subjecting the patient to a dose of something. Okay. And in making reasonable allowances and reasonable inferences with respect to societal causes, with respect to behavioral causes, in this whole arena, looking at reasonable division of responsibility for -- for how -- how this whole thing could -- could work out. Then you say, okay, now, all right. Given all of that, what would be your feeling, even though we can't isolate causation, even though we can just say to our best guess, we're trying to do something to where -- but we're honestly

attempting to attribute a cause -- all known causes and so on. Is there going to be some stuff that you would say would end up being in the smoking basket? Yeah, there would be some stuff there.

My uncertainty associated with that is not in the -- in the second decimal place. It's in the first decimal place. As -- as terms. I think that it's conceivable that it could be as little as 25%, maybe even -- maybe even less than that of what the state alleges.

The -- how high could it be? Could it be higher than what the state alleges? There's several things that's mentioned in the expert report, we tried it on this conservative side, doing this, doing this, doing this, doing this.

No, I think the state has pretty much attempted to be -- I think there's been some attempt at honesty in these areas. I don't think these are corrupt people. I don't think the people that put this model out here have axes to grind. I don't think they look at tobacco companies as their enemy. I think that they were people that were given a task and, you know, how do we solve this problem, and attempted as professionals to solve it.

I have a major objection to the way I think

Minnesota assigned the task, but, you know, I don't think -- it's not dishonest people. These are not people that are attempting to confound.

I'm wondering about Samet. There are a lot of the things he says in there that I'm concerned about.

But the statisticians, and the way they attempt to present stuff, I think they've kind of buried some stuff, think we'll get criticized for this if we make this too obvious.

But I don't think that there's any -- I think that -- I think that it would be difficult to state the case more generously on Minnesota's case. Maybe that's what -- maybe that's what these adversarial things are all about. I don't know. Hey, let's ask for the moon. Let's make our model. Let's not make it so obvious that we're going to be attacked on every possible front that we're going to look like a total fraud. But let's inflate it to any extent that we can. And I'm not sure -- to a certain extent the model does that. Because it doesn't attempt to make any -- any other known adjustments. It ignores a lot of data. I think there's an honest attempt to use a lot of the data that's used. I don't think people have deliberately picked a model that they thought

would hide the truth and allow them to inflate the figures. They made it real hard for people to understand what's going on in their model.

But I don't -- so, if you want a range, that -- and believe me that's just the seat of the pants. Okay. I don't think you could possibly make -- and I think if the truth were really told, and if responsibilities were assessed the way a reasonable civic-minded person would assess responsibilities, you know, it could be as low as 20%.

Q. 20% of what?

A. That's without assessing costs. You know, I mean sort of no-fault divorce. We're just going to go out there and --

Q. 20% of the amount that the state is claiming?

A. Uh-huh.

Q. Would it be --

A. So it's somewhere between that. I'm putting a lower bound. Okay. I'd like to know more. And certainly I'd like to know more in those particular areas where one could know more, to actually collect the data.

Q. Between 20% and 100% of what the state is claiming?

A. Yeah.

Q. Okay. What about for Blue Cross?
A. Um, --
Q. Roughly comparable?
A. Probably the percentage is less for Blue Cross because we begin looking at a different population of people. We're now looking more at -- at least as I understand it, a population where -- where probably some of the more available statistics fit better the population, than in the Medicaid population. So I don't know. 30%.
Q. Between 30% and a 100%?
A. Yeah.
Q. Okay. Let's go on to the next --
A. Then, you know, I'm doing that -- I'm doing -- not even back of the envelope calculations here. There's a lot more in to it.
Q. I understand the numbers are broad, general numbers. But the concepts are concepts you understand; right?
A. Yes.
Q. Okay. Let's go on to "Diagnosis of Disease" on the bottom of page ten.
Would a clinical history of a patient typically include a history of cigarette smoking?
A. Depends on how the patient presents and the

reason for it. A patient that comes into the ER and says, "Doctor, somebody just stabbed me," I don't think I'm going to take a smoking history. May well patch that person up and send them on their way without ever knowing.

A patient who comes in and says, "Doctor, I've not been feeling well recently, I think I may be having a fever," da-da-da, vague complaints and whatever else -- we'd do a more thorough evaluation of that patient and would probably take a full social history, including smoking history.

Q. If a patient comes into the office with complaints of persistent cough, is the fact that the patient reports current smoking status, a value in formulating a differential diagnosis?

A. Yeah.

Q. How so?

A. The -- how so? One, we're already talking about coughing. We're interested in -- in seeing whether or not we have an irritant that is apt to be producing the cough. So one of the simplest knee-jerk responses, is do we have some sort of environmental, including tobacco smoke I'm talking about, as a smoker -- what, you know. I would ask tobacco smoke -- I would also ask a lot of other

things, "What do you do for a job? What do you do for a living?" If somebody says, "I finish floors," I'd say, "Do you wear a mask all the time?" And so we'd end up getting a full occupational and social history, including smoking.

Q. Is your opinion that diagnostic information is, per se, invalid, or that we should -- rather that we should recognize the possibility of this diagnosis?

A. Would you rephrase that one more time?

Q. Sure.

A. I didn't really get the question.

Q. Is your opinion that diagnostic information is, per se, invalid?

A. No. Diagnostic information is diagnostic information. Okay? There's several categories of diagnostic information. There's some which is qualitatively more valuable than other types of information. Among diagnostic information are laboratory tests that we run on patients. Among diagnostic information are x-rays that we take of patients and other sort of imaging techniques. So to say that that's invalid? I mean it's data. It's there. Okay. Some of it can be misinterpreted. Some of it is relatively straightforward for interpretation.

Q. So if in an epidemiological study or statistical study you're using diagnostic information off a patient's chart, --

A. Yes.

Q. -- is the information, per se, invalid or is there a degree of uncertainty that is associated with it?

A. Okay. Can I make a distinction here --

Q. Please --

A. -- between when you say diagnostic information -- are we talking about the diagnosis where the doctor writes down at the end of the assessment of the patient the disease the doctor thinks they're dealing about?

Are we talking about the data that the doctor used in formulating that notion?

Q. The former.

A. The former?

Q. Yes.

A. Okay. Is -- is -- there is some major problems with the validity of certain types of diagnosis. Certain diagnoses are relatively difficult to make in just clinical assessments, so that just a history and physical will often be woefully inadequate to make a diagnosis. And one of these examples would be

extremely difficult to make a diagnosis of lung cancer on a patient based on history and physical unless the patient told you, "Doctor, I went to see some other doctor at such and such hospital and he says I've got a tumor."

Q. All right.

A. Okay.

Q. But when a doctor writes down a diagnosis as the final conclusion, --

A. Uh-huh.

Q. -- is it, per se, invalid to use that kind of information in epidemiological or statistical study? Or is it your opinion that you need to take into account the potential for error?

A. Certain -- the question is what one is attempting to do with the data. If one is attempting to come to some sort of quantitative conclusion with respect to it, then certainly one needs to take into -- into consideration the likelihood and the amount of likelihood of misdiagnosis. If, in fact, one is just saying, "Well, we're going to use this just as a statistical thing and we're just going to see on a purely statistical basis, we've got this particular diagnosis, we know there's error. We know there's slop there, but can we come to some sort of

conclusion?" There would be circumstances in which it wouldn't be necessary to refine the data more.

Q. Are there any other specific reference sources that you specifically consulted in putting together your report for the categories of misdiagnosis, diagnostic bias issues, and miscoding issues, other than the ones that are listed on pages twelve and thirteen of your report?

A. There were no -- with respect to the preparation of this report, the answer is no.

Q. Did you actually read these articles that are listed on pages twelve and thirteen?

A. Yeah.

Q. Yes?

A. Yes.

Q. You read them during the period in which the report was being prepared?

A. Several of them I'd already read. I was given some articles that had -- that related on this topic. I had suggested some of the areas that we needed to look at. I think counsel had somebody do a literature search for me. I asked them if they'd do that. And they came up with some articles. I would say I'd probably read half of those articles already. Most of the articles dealing with autopsy come from

pathology literature and, therefore, I'm fairly familiar with those articles.

Q. Did you --

A. There are several other articles. By the way, we could have cited lots of articles in that respect.

With respect to diagnostic accuracy, and autopsies, and the autopsies used for that, it's not necessary just in smoking-related illnesses, but in many, many other kinds of disease.

Q. Did you rely on any of those other articles beyond the ones listed on pages twelve and thirteen, specifically in putting together this report?

A. Only in the sense that, as a pathologist, I would be in general aware of those. This is the sort of thing in which general awareness of a pathologist of the ordinary literature would be expected, yes.

Q. Okay.

A. So there were others, but I can't cite them. I can't give you the specific references.

Q. You yourself have relied on diagnostic information in your own epidemiological studies, haven't you?

A. Yes.

Q. Does the fact that there can sometimes be bias

in diagnoses of disease, mean that we should ignore diagnosis of a patient?

A. Depends on the objective. Again, I'm going to go back to what I just said earlier. I think in -- one of the things we talked about here with respect to my particular involvement in one epidemiological study which had to do with surveillance of HIV disease, and there were already so many confounders and biases, that what the CDC -- Center for Disease Control was actually looking for was relative changes. The question is: Is it likely, over a period of time, that the doctors are going to diagnose or misdiagnose much -- much better or worse over time? The feeling was no. Therefore, looking for a change. Those factors would cancel out. And, therefore, you could come to a valid conclusion even in the face of error.

On the other hand, if we're talking about assessing economic damages, based specifically -- strictly upon diagnoses that have been taken out of medical records, then the accuracy there makes a difference of many, many, many millions of dollars and I think it behooves one under those circumstances to attempt to validate the diagnoses better.

Q. In the latter situation should we not use

diagnoses information?

A. I didn't say that you shouldn't use it. I -- but I think one needs to validate it. One needs to confirm and to verify the accuracy of the data that's being used. And when one goes to do that, one's going to find there's substantial inaccuracies. We know that.

Q. Is it your position that for the -- strike that.

Are you audited for the use of your -- are you audited for the use of ICD-9 codes in your lab?

A. To this particular point, we have not been audited.

Q. What authority supports your position that ICD-9 codes are not appropriate for epidemiological or statistical purposes?

A. Anybody who's ever used the darn things. In American medicine, the way we practice American medicine. They're -- they end up being way, way, way too specific in areas of infectious disease and so on. Or too broad in other cases. They completely leave out --

As an example -- just as an example of something you cannot do with an ICD-9 code. I can't make the distinction as to the various types of lung cancer

that exist. I can make some -- I can make some distinctions with respect to the sight--whether it's upper lobe, lower lobe, middle lobe, and so on. But I can't tell you whether or not it's small cell, large cell, whatever. Okay. Those terms don't exist in the ICD-9 classification. Are those terms relevant to the prognosis, the understanding of lung cancer? They're enormously relevant. We wouldn't exist as a specialty if that were not the case.

Q. I understand your position. I understand your explanation for your position. I'm asking you to cite an authority that supports the position that ICD-9 codes are not appropriate for epidemiological or statistical purposes.

A. To a large extent ICD-9 codes were developed to do epidemiological studies in the third world. So that the idea that they are inappropriate for epidemiological studies obviously would be a non sequitur.

On the other hand, as we practice medicine and as it is practiced in the State of Minnesota, it ends up being a horribly inadequate system. And I think anybody that is reduced to having to use those codes will tell you that they are grossly inadequate for classification of disease in the broader sense. You

can regard that as being epidemiologic if you want, or not. I regard it as being epidemiologic. I have yet to meet the first -- the first medical scientist who was at all concerned at all about the nosology of disease that used ICD-9 codes for their own studies.

Q. Doctor, please cite me a reference for the proposition that ICD-9 codes are not appropriate for epidemiological or statistical purposes? If you don't have one --

A. Okay. The NMES study.

Q. The NMES study says that ICD-9 codes are not appropriate for epidemiological or statistical purposes?

A. Yeah. They attempted not to use them.

Q. Did they say that?

A. I don't know what they said. I mean the fact that they attempted not to use them is part of the problem.

Q. You're drawing conclusions from published research. You list a lot of research.

A. Uh-huh.

Q. You draw conclusions based on your own experience and your review of the research.

A. Yes.

Q. I'm asking you for any authority that states

that ICD-9 codes are not appropriate for epidemiological or statistical purposes?

A. The fact that they're not used in the great majority of research studies, I think is -- is de facto proof that they're inadequate for epidemiological studies.

Q. You can't cite an authority sitting here today?

A. I can't cite you an authority. However, all of the people who purport to be authorities to do epidemiological work, the fact that they rarely use ICD-9 codes for their own investigative works ends up being proof of the inadequacy of that system.

Q. What about the forty-year British doctor study?

MR. CURTIS: I'm going to object to the form of the question in that it's ambiguous.

BY MR. ORENSTEIN:

Q. Is that study invalid because of the use of ICD-9 codes?

A. No. No. It's -- I -- maybe we're having a misunderstanding as to what I'm talking about are the limitations and the problems associated with ICD-9 codes.

The -- what did I say in that respect to the -- that could lead you to question whether or not I felt as though the BMJ study --

Q. Second-to-the-last sentence of your report says, "ICD-9 codes are not appropriate for epidemiological or statistical purposes."

A. Okay.

Q. Did you write that?

A. I did write that, yeah.

Q. Do you agree with it?

A. Yeah, I do agree with it.

There's something a lot better, okay. It's a lame-brain way of doing things. I think at the time -- those studies were started forty years ago, there may not have been something that was a lot better. The SNOP coding method didn't come into existence until sometime in the late '60s to early '70s. SNOMED didn't come into existence for another several years.

The National Library of Medicine coding system for keywords didn't come into existence --

Q. Okay.

A. -- until maybe fifteen or twenty years ago.

That study started forty years ago. More than forty years ago. There wasn't a lot that was available as an alternative. They would have had to invent something of their own. They adopted an old coding system that subsequently was outdated.

Subsequently replaced by a more modern adaptation of ICD coding. And they subsequently had to go back and recode some of their data because of that.

So in their particular case, I don't think that it was inappropriate for them to do that.

If anyone were to start the study today and to use those codes, they would be irresponsible.

Q. You do consider yourself an expert in statistics?

A. Yes.

Q. Okay. Do you know what propensity --

A. Within the area of medical statistics, yes.

Q. Do you know what propensity scoring is?

A. Propensity?

Q. Scoring.

A. Scoring.

No, I don't know specifically what that is.

Q. To your knowledge have you ever used propensity scoring in any statistical analysis?

A. To my knowledge I've never used propensity scoring.

Q. To your knowledge have you ever seen any statistical analysis that used it?

A. It's -- I'm not sure whether propensity scoring deals with the area of medicine statistics or not, so

I'm -- not knowing exactly what the term is, I can't tell you whether or not I have actually read studies and evaluated studies that may have used propensity scoring.

Q. Okay. Do you know what multiple imputation means?

A. What multiple --

Q. Imputation?

A. Imputation.

Yes, I do.

Q. What does it mean?

A. Multiple imputation are cases in which -- in which there will be -- there may be multiple -- multiple explanations. Multiple inferences that are associated with a particular statistic or buried in a study.

Q. To your knowledge have you ever used multiple imputation in a statistical analysis?

A. No, I have not.

Have I read studies that have made reference to it? Yes.

Q. Is a statistical analysis invalid if it doesn't use multiple imputation?

A. No.

Q. Your report indicates that you have testified or

given depositions in a few different matters. Let's turn to page fourteen.

On whose behalf did you testify in the first instance, 1980 Federal Court Medicare Fraud Case?

A. Federal government.

Q. What was the nature of your testimony?

A. The nature of my testimony in that particular case was -- was whether or not in my expert opinion individuals had abused the Medicare reimbursement rules by creating a laboratory -- creating a laboratory which utilized semi-automated methods of analysis for which they could then bill Medicare for -- as manual procedures and -- and, therefore, were defrauding Medicare.

Q. Your conclusion was that people were defrauding Medicare?

A. Yes. That was my -- that was my -- my expert opinion was that people had rigged the laboratory specifically for the purposes of -- of recovering money from Medicare.

Q. You don't have any, per se, objection to a unit of government bringing a lawsuit to recover money which it claims to have paid out because of fraud?

A. No.

Q. You do in this case, though?

A. I don't know what the fraud is that's being alleged.
Q. But you object to this action? You've made that very clear.
A. Yeah, I do.
Q. What about the second example here about 1985 Federal Court EEOC action.
A. Uh-huh.
We -- there's a couple of EEOC suits that were here and -- and I discussed one. You asked me whether or not I actually testified in one, yesterday.
Q. I thought those were --
A. Do you recall that?
Q. I thought those were employment-related actions.
A. It was employment. That's why it was EEOC.
Q. Right. But these list acceptable laboratory procedures and laboratory management practices.
A. Uh-huh. Yeah. I mean that's what my testimony was -- was regarding in that particular suit.
Q. Okay. The first one, acceptable laboratory practices, what was the -- can you summarize the substance of your testimony?
A. The substance of my testimony -- this is number

two we're talking about?
Q. Yes.
A. They -- they -- what was alleged in that particular case was that someone had deliberately falsified patient laboratory results. And I was able to produce some computer reports that, in fact, proved that that occurred. And -- and so not only were those falsified laboratory results, but in fact there was an attempt to conceal and hide what had occurred because of an error that a technologist had made. And I testified as to the standards of practice of medical technology in that court.
Q. So you gave expert testimony?
A. Yes.
Q. You were not a fact witness? Maybe the term confuses you.
A. I'm sorry. I gave fact. I was not deposed as an expert witness.
Q. You worked there and you told what happened?
A. I worked there and I gave fact testimony.
I'm sorry.
Did I call it expert testimony?
Q. No, I'm just trying to inquire --
A. Okay.
Q. In the first case we discussed, were you an

expert?
A. Yeah, I was qualified as an expert witness.
Q. In the first case did you give a deposition, as well as court testimony?
A. Yes, I did.
Q. How about in the second case?
A. Yes, I did.
Q. In the fourth case could you briefly summarize the substance of your testimony?
A. I was given a whole series of Medicaid bills from a representative from the state of Florida. I was given, in addition to that, some copies of -- of records of patient visits that had occurred. And I was asked for an opinion as to whether or not I felt as though fraud was being committed in this particular case. And I testified that I felt as though that there was. And I was told that -- that I may be -- may be deposed as an expert witness, to testify, based on that. And they settled the case.
Q. After your deposition?
A. Yes.
Q. But you were deposed as an expert witness?
A. Yes.
Q. Okay. Medicaid fraud and abuse is not one of the subjects of your expert report in this case, is

it?
A. No.
Q. Okay. Just want to make sure.
A. No. I don't think so.
Q. I mean -- no.
Let's go back to the third lawsuit, which I think I skipped over. What's the substance of your -- could you summarize the substance of your testimony in the third one? The EEOC regarding laboratory management practices?
A. Yes. This was another one that never got to trial. It involved an employee who felt as though she had been discriminated against regarding her -- her promotion, a promotion of -- position available for promotion.
I had been a member of the -- of the screening committee that made recommendations for the promotion. And I was deposed in that particular case regarding how laboratory management comes to conclusions, how committees are constructed, et cetera, to make decisions associated with promotion.
Q. Were you an expert witness in that lawsuit? Or were you testifying about facts of your own?
A. No, that was a fact.

Q. What about the second-to-last one? Please summarize the substance of your testimony.
A. Okay. This, again, was as a fact witness. There was a -- an instance of a patient who was accused of driving under the influence, who had killed several other people. And who had come to our hospital for treatment. The driver or -- and I was deposed with respect to the way in which we acquire specimens, the way we handle the specimens, the way we label the specimens. The way we identify the patients, et cetera. Sort of a chain-of-custody kind of --
Q. You were a fact witness?
A. A fact witness in that case.
Q. What about the last item there? Please summarize the substance of your testimony.
A. I'm drawing a total blank on this.
Q. We're nearing the end. Don't blank out on me.
A. I do apologize. I'm not trying to delay the proceedings here.

Oh I -- it's finally come to me.

This was -- if I'd read what I said here, malpractice suit. Again, this was -- I was a fact witness. There was a patient who had -- who had had the misfortune of getting caught -- getting ready to

leave the hospital at the same time that we were generating some diagnostic information. Managed to get out of the hospital when they shouldn't have gotten out of the hospital and ended up coming back twelve hours later with severe encephalitis and ultimately died. And I was deposed as a fact witness regarding how the system worked and who should have known what when.

Q. I see. Doctor, specifically what is it that the State of Minnesota knew for many years that causes you to take such strong objection to this lawsuit?

A. I don't single out Minnesota. My comments apply equally to Florida, where...

I take the position that state attorney generals and legislators have said, okay, we've abused our population. We've collected all these taxes off of cigarettes and we haven't done a damn thing to lessen in any way, shape, or form the risks which we've known about for the last thirty or forty years associated with cigarettes. Let's go see if we can rip off the tobacco companies and get some of it back.

They're sitting in a position to where they can use the state's authority to do this abusive process.

I take some major objection to that.

Had the state demonstrated in good faith that it was out their working to do what it needed to be doing for its citizens over all this time, with the information that was generally available to them, I would have a very charitable view with respect to their actions.

Q. What do you know about what the State of Minnesota did to try to promote nonsmoking?

A. I have very little specific information --

Q. What do you know?

A. -- on that particular instance.

I've talked to some friends of mine who are from Minnesota and asked whether they are aware of any anti-smoking campaigns that the state has attempted to do. Whether or not the state is aggressive at all with respect to informing people about -- about what they need to do to -- to look after their health. And I've been told that, no, that the state is not very active in that regard.

Q. What specifically is it that you believe the State of Minnesota knew for many years that causes you to object to this lawsuit?

A. As a representative of the State of Minnesota, or counsel for the State of Minnesota, you're sitting

here and you are throwing out 1964 attorney general reports -- or surgeon general reports. Throwing out 1954 studies of Doll and so on. Does anyone read in the State of Minnesota? Was this something that -- oh gee, you know, maybe there's something to this? Is there any -- are there any public health measures that we think we should adopt in response to this? Or do we not know about this? Was this in a way an obscure medical literature. I mean it's true, it's a British medical journal. It is in English, though.

And -- and these are the sort of things I remember being very aware of.

I remember before I even got to medical school and graduate school, I remember as an undergraduate these were major issues that were talked about in society at that particular point. Does smoking -- this, that, whatever else it is. Okay?

This was -- if you go back to the late '50s, you'll discover that this was an extremely hot issue in the scientific community, the medical community. Lots of papers, lot of sort of stuff that's related to it. Why is it that now, in 1997, the State of Minnesota says, "Oh, I think we ought to do something about this. Let's go after the tobacco companies"?

Q. Doctor, did the State of Minnesota know more

about the health risks of smoking than the tobacco companies?

A. I'm not aware that the tobacco companies ever had any useful scientific information beyond what was available to the general public. They may have had -- they may have had some of that information a year earlier, or six months earlier, or whatever. But I think that all of the really important scientific information -- there has been millions and millions and millions of federal dollars that have been spent to generate information associated with this.

If you're talking about the MRFIT study -- do you have any idea how many scores of millions of dollars were associated with that, and when that particular study began?

I mean why is it -- why is it -- I mean how is this information hidden from all the people in Minnesota?

Q. Does the State of Minnesota, Doctor, know more about the causes of smoking than you do?

A. Does the State of Minnesota doctor -- I'm not sure --

Q. No.

Dr. Wunsch, does the State of Minnesota know

more about the causes of smoking than you do?
A. Know more about the causes of smoking? I'm not sure that the state, in a more general sense, -- I'm really talking about the people who were charged with the issues of public health. The issues of education. The issues of social well-being. The issues of medical access. I'm talking about those particular people.

Did those particular people know enough about these particular issues to have altered their behavior in the last forty years? My answer to that is a resounding yes. They had a lot of information and should have acted upon that information. Why they're Johnny-come-latelies, let's go out and sue everybody now, and see how much money we can rip off -- I'm outraged by that approach from a society that I think really needed to demonstrate more care for the citizens that it now purports to represent.

Q. Those policymakers should have come to a different conclusion about whether smoking causes disease than you've come to?

A. They should have come to a conclusion that they had a responsibility to inform their citizenry of the risk. They had a responsibility to help in the educational process. They had a responsibility to

understand a number of the demographic factors. They had a responsibility to -- to -- to at least in some cases attempt to minimize the amount of smoking that people did. Yes, they had a responsibility to do that because we know that there is risk.

We know on the other side, and we discussed this earlier, that -- that as far as the individuals are concerned, there's really minor, minor, I don't know, inconvenience, damage, whatever else you want to call it, cost, if they alter their behavior to minimize risk.

So the idea that somehow or another we could have adopted in Florida, in Minnesota, and other states, a more responsible public health policy -- and I'm talking about throughout. I'm talking about the area -- I'm going to criticize you as a legislator. You were there at that time. So was my father and my father didn't do anything about it either.

But... But those were issues that I think -- you know, that's my concern.

I think that what happened was people said, look, it's not the role of government. And if we're going to adopt that, then it's not the role of government to sue. There's my -- I have that

problem.

I have the problem that now we're concerned about it and we're going to demonstrate that through a lawsuit.

Q. And the state should have acted earlier because smoking is a risky behavior for the population of Minnesotans?

A. Yeah.

Q. Okay.

MR. ORENSTEIN: I don't have any more questions.

MR. CURTIS: We have no questions.

(Concluded at 3:08 p.m.)

***

C E R T I F I C A T E

STATE OF MINNESOTA }
}
COUNTY OF GOODHUE }

I hereby certify that I reported the continuation of the deposition of DR. WUNSCH, on the 4th day of September, 1997, in Minneapolis, Minnesota, and that the witness was, by me, first duly sworn to tell the truth;

That the testimony was transcribed by me and is a true record of the testimony of the witness;

That I am not a relative, or employee, or attorney, or counsel, of any of the parties; or a relative or employee of such attorney or counsel;

That I am not financially interested in the action and have no contract with the parties, attorneys, or persons with an interest in the action that affects or has a substantial tendency to affect my impartiality;

That the right to read and sign the deposition by the witness was reserved.

WITNESS MY HAND AND SEAL this 8th day of September, 1997.

_____
Janet D. Winberg, RPR
Notary Public,
Goodhue County, MN
My Commission expires
1/31/2000.

{Seal}